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FORESTRY

JANUARY 1954

SOCIETY OF AMERICAN FORESTERS 1900

Volume 52
Number 1

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Photograph American Forest Products Industries.

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Bob Winege, Forester-Manager of Wigington Tree Farm, Oconee County, South Carolina

Wood Treatment Converts Thinnings Into Profitable Product

Owners of tree farms everywhere are finding that they can utilize ALL of the material produced by their tract simply by installing a simple wood-treating plant.

As a good example of this type of thinking we refer you to Mr. Oscar Wigington owner of a large tree farm in Oconee County, South Carolina. When Mr. Wigington decided that he wanted to increase the profit yield from his land he hired Bob Winege as forester-manager for his plant, set up a saw mill and a simple wood-treating plant and proceeded to treat the timbers and posts cut from his property. Mr. Wigington chose the Osmose Process of wood preservation because of the ease and low cost of the treatment and because the material could be treated green or immediately after being debarked or sawed. Mr. Wigington's present satisfaction with the Osmose treatment is mirrored by Bob Winege's happy expression in the photo above.

The Osmose Wood Treating Process is one of the most effective yet simplest of all wood treating processes. For equipment you merely need an inexpensive dip-tank or the standard spray plant designed by Osmose. Hundreds of foresters and lumbermen are now making substantial profits as wood treaters. The opportunity is open to practically anyone in this field. If you would like to become a franchised producer of Osmose treated lumber we invite you to write for details, without obligation to John L. Surdam, Vice President and General Manager, Osmose Wood Preserving Company, Inc., 980 Ellicott Street, Buffalo 9, New York.

Adv.

Journal of Forestry

Official Organ of the Society of American Foresters

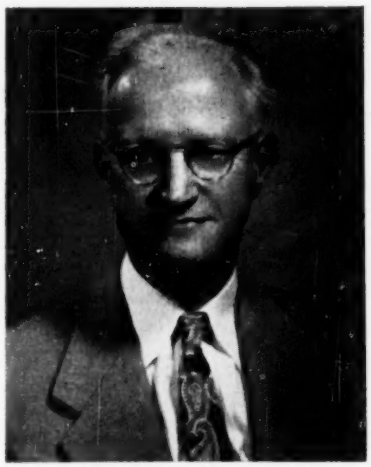
E. L. Demmon, DeWitt Nelson Elected S.A.F. President, Vice President

New Council, Fellows Named

Elwood L. Demmon of Asheville, N. C., was elected December 5 as president of the Society of American Foresters for the two-year term 1954-1955 by mail ballot of the members. He succeeds George L. Drake of Shelton, Wash., who was not a candidate for re-election.

Mr. Demmon has been vice president of the Society during the biennium 1952-1953. He is director of the Southeastern Forest Experiment Station, a unit of the Forest Service, U. S. Department of Agriculture. A forestry graduate of the University of Michigan in 1916, Mr. Demmon was for seven years thereafter forester for a rubber company in Sumatra. In 1925 he became silviculturist at the Southern Forest Experiment Station at New Orleans, and three years later was appointed director of the station. In 1944 he became director of the Lake States Forest Experiment Station at St. Paul, Minn., continuing in that position until May, 1951, when he was put in charge of the Southeastern Station.

DeWitt Nelson of Sacramento, Calif. was elected vice president of the Society. He is director of the California Department of Natural Resources. A 1925 graduate in forestry of Iowa State College, Mr. Nelson entered the U. S. Forest Service in California. During his twenty years with the Forest Service he was supervisor of the Shasta, San Bernardino and Tahoe national forests. Appointed deputy director of the California Department of Natural Resources in 1944, he became state forester a year later, in which position he served until his present appointment in September, 1953.



ELWOOD L. DEMMON

DEWITT NELSON

Council Members

Organized in 1900, the Society of American Foresters with headquarters in Washington, D. C. has a membership of 9,600 professional foresters in the United States and Canada. Its governing body is the Council, composed of the president, vice president, and nine additional members. The following foresters were elected to the Council for two-year terms.

William J. Brown, assistant chief forester, Kimberly-Clark Corp., Neenah, Wis.

C. Huxley Coulter, state forester, Florida Forest Service, Tallahassee.

Dwight B. Demeritt, vice president, Dead River Company, Bangor, Maine.

Stanley G. Fontanna, dean, School of Natural Resources, University of Michigan, Ann Arbor.

Percy D. Hanson, regional forester, U. S. Forest Service, Missoula, Mont.

Edwin F. Heacox, managing forester, Weyerhaeuser Timber Company, Tacoma, Wash.

Joseph S. Illick, dean emeritus, State University of New York, College of Forestry, Syracuse.

J. Herbert Stone, regional forester, U. S. Forest Service, Portland, Ore.

Ruthford H. Westveld, chairman, Forestry Department, University of Missouri, Columbia.

Fellows Elected

In addition to the foregoing officers, the following Fellows were elected to the Society. Election to the grade of Fellow is conferred only for outstanding achievement in forestry.

William T. Cox, consulting forester, St. Paul, Minn.

George L. Drake, vice president, Simpson Logging Co., Shelton, Wash.

James C. Evenden, entomologist-in-charge, Forest Insect Laboratory, U. S. Department of Agriculture, Coeur d'Alene, Idaho.

George A. Garratt, dean, School of Forestry, Yale University, New Haven, Conn.

Leo A. Isaac, silviculturist, Pacific Northwest Forest and Range Experiment Station, Portland, Ore.

Joseph Kittredge, professor, School of Forestry, University of California, Berkeley.

Richard E. McArdle, chief, Forest Service, U. S. Department of Agriculture, Washington, D. C.

Woodbridge Metcalf, extension forester, Agricultural Extension Service, University of California, Berkeley.

Ernest A. Sterling, consulting forester, Montrose, Pa.

Fertility Standards for Raising Douglas-Fir in Forest Nurseries[1]

C. T. Youngberg and R. C. Austin[2]

Oregon State College, Corvallis, and Crown Zellerbach Corp., Portland, respectively.

THE RESTOCKING of cut-over and burned lands in western Oregon and Washington is an immense operation utilizing the production of five forest nurseries. At the present time, over 90 percent of the stock produced in these five nurseries is Douglas-fir. The value of one acre of Douglas-fir seedlings in the nursery is about $15,000. It has been estimated that the cost of planting one million trees is $40,000. Multiply this by the total production and a figure representing a considerable investment is evident. How well this investment pays off depends on a number of factors, some of which can be controlled, others that cannot. It is essential, therefore, to make a thorough investigation of all possible means of improving nursery stock and its survival by manipulation of the controllable factors, thus holding the adverse effects of the uncontrollable factors to a minimum. One of the more important properties that can be controlled is the fertility status of the nursery soil.

Only fragmentary information is available on the nutritional requirements of northwest tree species. Gessel, et al. (*5*) using greenhouse cultures, are investigating the growth characteristics and response of Douglas-fir and western red cedar grown at various nutrient levels. Although greenhouse experiments furnish much valuable information on the nutritional characteristics of tree species, they are of little value in studying the complex and variable interrelationships that exist in nursery soils. This is particularly true with regard to mycorrhizal relationships, and conditions brought about by the treatment of nursery soils with fungicides, insecticides and weed killers. Moreover, the increase in growth brought about by increased levels of nutrients is not a valid measure of the quality of planting stock. Wilde, et al. (*13, 14*) and Wakeley (*9*) have demonstrated that morphologically similar nursery stock may be physiologically different, i.e., react differently when planted out in the field. The ability of planted stock to survive under adverse environmental influences is the final measure of its quality.

Wilde (*11, 12, 13*), following a lead pointed out by Hilgard, has done much to solve the complex problem of nursery soil fertility. Surface soils collected under productive stands of representative tree species were analyzed, and the values obtained represented the fertility levels of natural seed beds. He states that "such fertility levels appear to give the closest approach to the physiological optimum of growth conditions; they provide not only the amount of nutrients, which may be somewhat variable, but the constant ratio of various constituents which is of great importance in the balanced nutrition of seedlings" (*13*). This approach is based on the fact that different species growing on the same soil take up different amounts of nutrients, a phenomenon that has been well substantiated by many workers (*1, 2, 3, 6, 8, 10*). The return of nutrients to the soil by annual litter fall establishes a system of revolving fertility. The fertility of the surface soils that are influenced by the annual litter fall and subsequent humus formation is, therefore, a unique and definite expression of productivity factors. It should be pointed out that the nearly constant ratio or balance of the nutrient elements is, by and large, the most important consideration in the production of high quality nursery stock (*6, 7, 13*). The fertility standards obtained by the analysis of productive forest soils have been thoroughly tested and proven by practical reforestation operations in the Lake States (*13, 14*).

Nursery operations have been in progress in the Douglas-fir region since about 1912. It wasn't until just prior to World War II, however, that large volumes of stock were produced. After World War II, the production was again in-

[1]Approved for publication as Technical Paper No. 768, by the director of the Oregon Agricultural Experiment Station. Contribution of the Department of Soils in cooperation with the Weyerhaeuser Timber Company and the Crown Zellerbach Corporation. The field work and portions of the analytical work were carried out while the senior author was employed as Forest Soils Specialist by the Weyerhaeuser Timber Company.

[2]Associate professor of Soils, and chief, Forest Research Section, Central Research Department, respectively. The authors are indebted to E. C. Steinbrenner, H. W. Millan, S. E. Olson, K. Keister and M. T. Alexander for aid in various phases of the experimental planting work.

creased. This was due, in part, to rehabilitation projects on state lands, but to a greater degree to the rapidly growing tree farm movement. The majority of the stock produced by the Oregon Forest Nursery is utilized for the vast Tillamook Burn rehabilitation program. The state of Washington established a nursery at Bordeaux to provide seedlings for planting in the adjacent Black Hills. The forest industries cooperated in establishing a nursery at Nisqually, Washington to furnish stock for their planting programs. The Forest Service and Soil Conservation Service also operate nurseries in the Douglas-fir region.

Unfortunately, these forest nurseries were not located in the most desirable places from the standpoint of soil management. Nursery soils range from coarse, sandy soils underlain at 18 to 24 inches by cemented hardpans (Alderwood series) to silty clay loams with heavy clay sub-soils (Olympic and Aiken series) and include a poorly drained bottomland soil of loam texture with a strongly mottled subsoil (Sultan series). As a result soil management problems are, in many instances, acute. All of the nurseries with the exception of one, use cover crops for organic matter maintenance. The existing fertilizer programs are largely the result of recommendations based on the needs of agricultural crops, and have not taken into consideration the role of mycorrhizal fungi, particularly in relation to phosphorus nutrition. As a result unbalanced ratios of nutrients have been found to exist in some nursery soils.

One of the first tasks given to the senior author when he became forest soils specialist for the Weyerhaeuser Timber Company was the development of a soil fertility program at the Forest Industries Nursery at Nisqually, Washington. The initial step was to make a complete analysis of the available nutrients in the soil, to be used as a basis for fertilizer recommendations. Secondly, fertility standards were needed for Douglas-fir and a project was set up to establish such standards. The methods described by Wilde (*11, 12*) were used for this purpose.

TABLE 1.—REACTION AND CONTENT OF NUTRIENTS IN SURFACE LAYERS OF SOILS FROM DOUGLAS-FIR STANDS

Soil reaction pH range	Total Npct.	Avail. P_2O_5 lbs/acre	Avail. K_2O	Exch. Ca me/100g	Exch. Mg
4.8-5.8	0.23±0.014	82.3±7.52	198.3±7.93	4.65±0.24	1.79±0.25

TABLE 2.—STANDARDS OF FERTILITY FOR RAISING DOUGLAS-FIR

Soil reaction pH	Total N pct.	Approx. level of avail. N	Avail P_2O_5	Avail. K_2O	Exch. Ca	Exch. Mg
			lbs/acre		lbs/acre	
5.3	0.23	40	80	200	2000	450

The surface layers of soils to a depth of seven inches were sampled under productive stands of Douglas-fir in the Coast and Cascade Ranges of Oregon and Washington, and in the Puget Sound region of Washington. The soils were derived from residual materials of sedimentary and igneous origin as well as from transported materials of glacial, glaciofluvial, and alluvial origin. These soils were analyzed for pH value, total nitrogen, available phosphorus and potassium and exchangeable calcium and magnesium using methods adopted by the Forest Soils Committee of the Douglas-fir Region (*4*). The results of these analyses are given in Table 1, and are based on 54 sample observations. Table 2 presents in round numbers the approximate levels of soil fertility factors which may be used as standards in the raising of Douglas-fir seedlings in forest nurseries.

The nitrogen-phosphoric acid-potash ratio was found to be about 1-2-5. This ratio is the same as that found for other coniferous species. It is also of interest to note that the level of nutrients approximates that for eastern pine (*11*). The principles of nursery soil fertility maintenance and adjustments have already been adequately described by Wilde (*13*). It should be mentioned, however, that one of the important keys to the nursery soil fertility problem is the maintenance of an adequate supply of organic matter. This is particularly significant with regard to the nitrogen economy in the soil. Until fertility standards are established for other western coniferous species, it would be more desirable to use the standards herein outlined than to continue the use of recommendations based on agricultural crop requirements. This is especially true in the case of species found growing in association with Douglas-fir, such as noble fir, Sitka spruce, Port Orford cedar and redwood.

Prior to the establishment of these fertility standards for Douglas-fir, it was necessary to make fertilizer recommendations for the 1951-52 crop at the Forest Industries Nursery. Results of soil analysis had revealed an unbalanced ratio of nutrients. The content of available phosphorus was extremely high, in some instances being five times as much as required. On the other hand, the content of available potash was found to be only half of that normally desired. It had been observed that Douglas-fir and eastern white pine were somewhat similar in their silvical characteristics, so it was assumed that they might also be similar in their nutritional requirements. It was, therefore, recommended that no phosphate fertilizer be added and that the rate of potash application be increased. In order to compare this recommendation with that previously given, two treatments were used as given in Table 3.

In addition to the original application, treatment No. 2 received a supplemental addition of 200 pounds per acre of 50 percent sulfate of potash on August 7. Since

TABLE 3.—RATE OF FERTILIZER APPLICATION TO 1-0 DOUGLAS FIR SEED BEDS AT FOREST INDUSTRIES NURSERY, SPRING, 1951

Treatment No.	Fertilizer and rate of application Lbs./acre	Amount of N	Amount of P_2O_5 Lbs./acre	Amount of K_2O Lbs./acre
1	500 lbs. 3-20-20	15	100	100
2	100 lbs. 20% ammonium sulfate; 300 lbs. 50% sulfate of potash	20	0	150

TABLE 4.—MIDSUMMER SURVIVAL OF 1-0 DOUGLAS-FIR SEEDLINGS HAVING RECEIVED DIFFERENT FERTILIZER TREATMENTS IN THE NURSERY

Location	Fertilizer treatment No.	Condition of Seedlings Alive	Dead	Doubtful
		Percent		
Vail Tree Farm	1	88.88	9.53	1.59
	2	97.15	2.07	0.78
White River Tree Farm	1	87.57	8.45	3.98
	2	97.02	2.98	0.99

the fertility standards for Douglas-fir and eastern white pine are approximately identical, it was felt that the survival of planted seedlings, having received the fertilizer treatments as outlined, would give preliminary information on the value of the standards. Seedlings were lifted in February, 1952 and two small experimental plantations (600 trees) established on Weyerhaeuser Timber Company tree farms. One was put in at the Vail Tree Farm on February 28 and the other at the White River Tree Farm on March 14. The planting stock was 1-0 and derived from two separate seed sources. An animal damage appraisal was made six weeks after the date of planting. Survival counts were made during the month of July. Seedlings were classified as alive, dead, or doubtful, i.e., doubtful that they would live through the first season. The results are presented in Table 4. The animal damage immediately after planting was of light intensity and was in no way related to later mortality.

Although the differences reported in Table 4 are not large, the similarity of the results at the two locations indicates a definite trend. This trend, plus the practical nursery and reforestation experience already gained in the Lake States, strongly substantiates the belief that the use of similar fertility standards for Douglas-fir will provide conditions that more nearly approach the optimum in soil fertility.

A survival examination of the White River plantation made by Weyerhaeuser Timber Company foresters on Nov. 4 revealed that the majority of the seedlings previously classed as doubtful had died. The survival percentages for the two treatments were as follows: (1) 86.50 percent; (2) 95.25 percent.

More detailed experiments, designed to thoroughly test these standards, are now in progress at the Forest Industries Nursery. However, it will be several years before results from field trials will be known, since the nursery operations are being converted from the production of 1-0 stock to 2-0.

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The Continuous Carbonization of Wood in Small Retorts Without the Recovery of By-Products

Robert S. Aries
Consulting Engineer, New York City.

THE INSTALLATION of new factories for the production of charcoal, with recovery systems for by-products as presently conceived, does not appear to be feasible in this country. Under American conditions the erection of recovery equipment is prohibitive, because synthetic methods can produce these chemicals at lower costs. The only product which has not been synthesized is charcoal. In many cases it has been found desirable and economical to produce charcoal from wood or wood-waste without the recovery of by-products. The future expansion of the charcoal business will undoubtedly be in this direction, as more and more of the old plants are scrapped. To accomplish such carbonizations, a continuous process has been devised and used successfully in Europe for about fourteen years. The temperature for carbonization is maintained by recycling automatically a part of the gases produced during carbonization; and thus no additional heat is required in the form of solid or gaseous fuel when dry wood is utilized. In some units usually no pumping equipment and no fans are required; there are no moving parts with the exception of the sliding discharge gates and the charging door. Such continuous systems are the simplest mechanical device which could be constructed for the purpose. The retort is usually specified in a size that will produce about five tons of charcoal per day per unit, when kiln dry wood is used, and which is considered an optimum unit. Two of these units are necessary for economic production. The dimensions of a typical unit are a diameter of eight feet and a cylinder height of fourteen feet, with an overall height of twenty-one feet. This height can be increased to burn moister wood (such as green slabs), as the top portion of the retort serves as a drying zone. The fixed carbon content of the charcoal so produced is much higher than in a conventional batch process.

Names of Retorts

The principle of continuous carbonization was first evolved by Raschig in Germany and a successful installation was made in 1936. The principle of recirculation was perfected by Lambiotte, who is believed by this writer to know more about wood distillation and by-product recovery than any other person in the world. Others who have developed continuous processes utilizing recirculation include Wendt, Strupp, Eri, Progil, Brouillet, Mellman, Cusi and a number of others. The advantages of some of these over others are difficult to recognize. It is believed that "know-how" is far more important than patents in such manufacture. The principle of continuous wood distillation has completely proven itself technically and the writer and his associates have seen, inspected or operated about a dozen such plants in several different countries.

Charcoal Yields

The yields of charcoal by continuous processes are similar to the yields in other types of standard retorts such as the old fashioned oven type. If a completely air tight and automatic system of loading and unloading is used, the yields are somewhat higher; in the cheaper and smaller installations the yields are somewhat lower. Naturally, the yields depend on the type of wood used and its moisture content, as well as its age since cutting. Using northern hardwoods, there is produced normally about 48 to 52 bushels or 960 to 1,040 pounds of lump charcoal from one cord (128 cu. ft.) of dry wood. This amounts to 1 short ton from 265 cu. ft.; 1 long ton from 283 cu. ft.; or 0.348 long tons per 100 cu. ft. In addition to the lump charcoal, there is produced a certain amount of braize or fines. With denser woods the production would be higher.

There is no substantial difference in the amount of charcoal produced from wet or dry woods, but the daily production of a retort is higher when charged with dry wood. Production figures are generally based on the use of air-dried wood containing 20 to 25 percent moisture. The amount of charcoal produced will go down somewhat if wood containing 50 percent moisture is used; and if the retort is specifically designed to use green wood, a greater cylindrical height would be allowed to affect a more efficient drying section. The amount of production depends also on the size of the wood, whether billets or short sections are used, the latter with the greater possibility of heat flow and gas discharge to and from the end grain of the wood. Chips, slabs, edgings, and other mill refuse may be used, although uniformity of size of material will enhance the operation, with the exception of sawdust and small chips which may be added in some very small amount along with the larger wood. The feed hopper of this retort may be designed to use either long wood in billets, i.e. 48 to 52 in., or to use wood which is cut into about one foot lengths. In the event that the long wood is used, it is desirable that any piece larger than 4 in. in diameter be split, although this is not necessary for short lengths. The carbonization of short wood proceeds much more rapidly, due to the end penetration of heat and the rapid exhaustion of gases and moisture from the end faces. Thus wood of any convenient size may be used. The charcoal thus formed is dense; hard; and when the retort is properly operated, has a high carbon content with a minimum of fines.

Construction and Operation

The top of the retort has two or more stacks to exhaust the gases which contain all of the moisture originally present in the wood, the

products formed by combustion, and any volatile products which have not burned. The top or cover is conical to allow an even distribution of wood and is integral with the charging hopper and its balanced, sealed door. The wood is charged from time to time through this door, and in settling down through the retort, is preheated in the drying zone by the countercurrent flow of hot exhaust gases. Most of the moisture of the wood (if wet wood is used) is driven out by the heat of these gases, and their discharge temperature is only about 300 to 350°F. Until this moisture is driven out, the temperature cannot go much above the boiling point of water, although after this first step is accomplished the temperature of the wood will rise comparatively rapidly.

Some loss of chemically combined water takes place until a point is reached where the process of decomposition of the wood due to increased temperature liberates sufficient heat to increase the temperature autogenously. The exothermic reaction proceeds, the wood enters the distillation zone, the temperature rises spontaneously and the volatile products of wood distillation are produced, with the gradual breaking down of the cellulose and lignin molecules to give solid materials which are more and more refractory until ultimately only charcoal remains. In a batch operation these reactions occur at different times while in a continuous operation all of the steps are proceeding simultaneously at different levels in the descent of the wood in the retort.

The distillation zone is not mechanically distinguishable from the drying zone above, but the higher temperatures of the wood here cause and are caused by the cracking of the lignin and cellulose molecular structures to give much simpler volatile molecules. Some of the gases so formed pass upward at a temperature of 400 to 500°F to the drying and heating zones. A system of recycling pipes may be provided for removing the remainder of these gases and recirculating them to the base of the retort, where they are mixed in a specially designed carburetor and burned as they pass through its tuyères. The gases as produced in the distillation zone contain all of the usual pyroligneous acid, tars and tar forming chemicals, non-condensables such as CO, CO_2, H, and a small amount of N (in addition to the major amount from the entering air) etc. A small amount of tars are condensed and run to a catchall under the base of the retort.

The carbonizing zone is not sharply distinguishable from the distillation zone; and in it there is driven out the heavier volatiles to result in a low volatile charcoal which rests on the grates. The weight of the burden above breaks the pieces to passable size only when they are completely charred, hence practically no "bones" can pass through to the discharge orifices below. These discharge openings are opened and allow the charcoal to pass into sealed quenching drums. When a drum is filled it is disengaged from the retort and a cover is immediately applied to seal the drum during its cooling period. An empty drum is re-engaged with the retort and the discharge gate is reopened. The time that the hot carbon is open to the atmosphere is only a few seconds, so that there is no danger of fire in the drum. There is necessary a small carriage to disengage and transport the hot drum to the cooling area, where no provision except atmospheric cooling is required. In operating the continuous retort, therefore, the gases from the top of the distillation zone pass to a central carburetor, where they are mixed with some air and burned to incomplete combustion, to give a reducing steam at about 1000°F. at the grates. The gas passes uniformly upward through the burden in the carbonization zone, where the reducing nature of the stream prevents the loss by combustion of the charcoal itself. The temperature of the gas is continually reduced from the grates upward as it accomplishes its carbonization, distillation, and drying functions.

In starting the unit, more air is added to the carburetor, to build up the temperature of the charge by combustion of some of the wood and kindling initially present. The air necessary for combustion is then gradually reduced until the process proceeds by exothermic reaction and heat from part of the gases evolved.

The only controls which may be used on the retort of the simplest design are a pyrometer with a sensitive element at the grates and an outside indicator. A simple thermostat is sometimes installed to control the valve admitting air, thus assuring a reducing rather than an oxidizing gas stream.

Labor

In the normal operation of a two retort set-up, handling about ten cords per day each, one day supervisor and one man per shift is required; i.e., three shift-men or 24 man-hours of labor per three to five tons of charcoal produced per retort. This is assuming a mechanical conveyor for elevating the wood to the top of the retorts. An extra man may be necessary on the day shift as a supervisor and to help in the sorting of the charcoal. If the charcoal will be bagged, additional help will be necessary.

With two retorts in a battery, one man operates the top levels and aids on the lower, and one the lower exclusively; i.e., 48 man hours of labor for 6-10 tons charcoal produced. There is required additional labor in the day shift for wood preparation and charcoal handling. The amount of this labor will depend on the type of operation conducted.

Installation

In the usual case, the retorts would be operated in a central installation and there would be provided overhead a canopy to protect the operators from the weather. In cold climates the entire installation should preferably be enclosed. There would also be a shed for the handling of the charcoal when cooled and dumped. Storage and loading facilities should be pro-

vided as desired.

Conclusion

It is the opinion of the writer that this continuous carbonization system is the most practical as well as the cheapest way to produce charcoal without by-product recovery and in small amounts. We believe that such manufacture is particularly attractive to those who can obtain a source of low cost wood, such as wood waste. This system is suited for slabs, edgings, trimmings, and other types of waste, as the bark content is not of much significance in many uses. It is believed that the charcoal industry of the future will be primarily in small units scattered throughout the country where some of the factors of plant location, particularly a low cost raw material, will influence the exact sites.

A Thinning Study in Flatwoods Longleaf Pine

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ALTHOUGH MUCH RESEARCH effort has been spent on the silviculture and management of the longleaf pine type, comparatively little has been devoted to the problem of thinning and optimum stand density on the longleaf soils of northeast Florida and southeast Georgia. For a more productive site in Alabama, Gaines[1] has shown that optimum density for thinning 22-year-old longleaf may lie in the range of 500 to 900 trees per acre averaging 3 to 5 inches in diameter. A similar though less comprehensive study near Lake City, Florida, on typical flatwoods soils of the region contains fragmentary evidence that maximum volume growth of longleaf may be obtained over a rather wide range of stand density.

In 1932, J. G. Osborne and V. L. Harper set out 22 quarter-acre and half-acre plots for the purpose of estimating the effect of residual stand density obtained through thinning upon the yield of crude gum in young stands of second-growth longleaf. Sites selected for study on the Osceola National Forest and the Olustee Experimental Forest were on typical Leon soils of the longleaf flatwoods: poorly drained sands, often underlain with hardpan, and characterized by a low vegetative cover of sawpalmetto and wire grass. The original stand of virgin longleaf had been logged in 1888, and was again cut over after the hurricane of 1896. When the study was established, the stands were 25 to 35 years old and had been burned and grazed throughout most of their life. Stocking on the study plots ranged from 70 to 90 percent of normal basal area, averaging 80 percent. Site index averaged 65 feet with a range from 55 to 75 feet. Prior to treatment, average diameter on the plots ranged from 3.5 to 6.5 inches, basal area from 65 to 114 square feet per acre, and volume from 7 to 30 cords per acre. Of the 22 plots, 7 were retained for controls, and the remaining 15 were assigned cutting intensities such as to leave 100, 150, 200, 250, 300, and 400 trees per acre. The principal product objectives was naval stores, and marking was done by the "space-selection" method of thinning by which selected crop trees of largest size and highest vigor were left at reasonably uniform spacing. In general, trees removed in thinning were intermediate or overtopped. By present day standards, the method would loosely resemble a precommercial thinning from below, though the cutting necessarily extended into the upper canopy in the heavier thinnings.

To remove the effect of starting

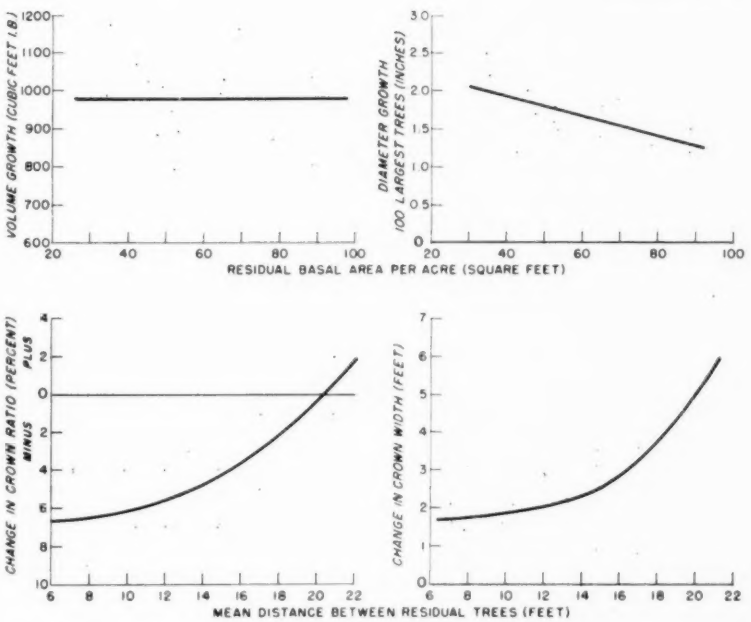
VOLUME GROWTH (CUBIC FEET I.B.)
DIAMETER GROWTH 100 LARGEST TREES (INCHES)
RESIDUAL BASAL AREA PER ACRE (SQUARE FEET)
CHANGE IN CROWN RATIO (PERCENT) PLUS MINUS
CHANGE IN CROWN WIDTH (FEET)
MEAN DISTANCE BETWEEN RESIDUAL TREES (FEET)

FIG. 1.—Sixteen-year change in cubic volume, diameter of crop trees, crown ratio, and crown width of longleaf pine thinned from below to varying stand densities at age 25 to 35 years. Lines represent computed linear regressions, and free-hand curves derived from 15 plots.

[1]Gaines, Edward M. A longleaf pine thinning study. Jour. Forestry 49: 790-792. 1951.

differences, plots were matched in pairs and groups representing equal sites, ages, densities, average diameter, and coefficients of variation in diameter. In subsequent years, 7 plots were destroyed by accidental burning and inadvertent cutting. Regression analyses of the remaining 15 form the basis for the following conclusions.

The more important results are shown in Figure 1. Generally, all responses were small. Average annual mortality did not exceed one percent of residual volume on any plot. Average annual volume growth for the 16-year period was two-thirds of a cord, but growth of individual plots varied widely. A regression analysis showed no significant relationship between residual basal area and volume growth per acre after thinning. Residuals from the line of mean increment (Fig. 1-A) showed no defensible correlation with site or any of the commonly used characteristics of the original stand or the residual stand after cutting. Considerably more data will be necessary to generalize the response in volume growth or to detect optimum density, but the tentative conclusion suggested by the data is that optimum volume growth in these longleaf pine stands may occur over a much wider range of residual density than in other forest types.

The remaining commonly used criteria of thinning response, diameter growth and crown development, offer some evidence that optimum density for thinning on these soils may be considerably lower than in many other forest types. Again, the responses were small. The average annual diameter growth for all residual trees was approximately one-tenth inch. Even the hundred largest trees, simulating the final crop, grew at a rate only slightly better than one-tenth inch. The curve of diameter growth of crop trees (Fig. 1) indicates that average growth rates better than one-tenth inch are obtainable only with residual basal areas less than 65 square feet per acre on these sites.

Crown development is also favored by very light densities. The crown ratio of sample residual trees on thinned plots and corresponding trees on check plots averaged 30 to 40 percent in 1932. By 1948, the ratios on all plots except one had dropped to from 26 to 37 percent. The change, however, was strongly correlated with residual spacing (Fig. 1), with the greatest decrease on check plots, and the least change on the plots thinned to 100 trees per acre. Thirty to 40 percent crowns are frequently recommended for southern pines, but in this study those ratios were not maintained in any except the lightest residual stands.

Growth in crown width, closely correlated with residual spacing, was also greatest on plots with residual densities of 100 trees per acre.

But in all stands, the rate of closure was very slow. Sixteen-year growth even in the lightest density did not exceed 7.6 feet. At this rate, stands thinned to 100 trees per acre, with an average spacing of 20.9 feet, would require another 15 years to close completely.

Conclusion

The data presented here are of interest chiefly as they reflect the basic relationship between stand density and growth rate per acre and per tree. With present-day markets for commercial thinnings of pulpwood, pre-commercial thinnings do not appear to be justified in longleaf pine, particularly in view of the early expression of dominance which characterizes this species. Consequently, the treatments used in this study cannot be considered typical of present-day management research or practice. Nonetheless, the mensurational aspects of the data do suggest that maximum volume production of flatwoods longleaf pine may be obtained over a wide range of stand density, and that light densities distinctly favor diameter growth and crown development.

The data further suggest that where fairly wide spacing is used to favor gum yields and forage production, the sacrifice in wood volume production of longleaf pine on these soils may be less than is generally supposed.

ESTIMATED EMPLOYMENT OF PROFESSIONAL FORESTERS IN FORESTRY AND RELATED FIELDS IN THE UNITED STATES

1.	Federal, all agencies	4,800
2.	State, all agencies	1,500
3.	County and municipal	200
4.	Education, including extension and institutional research	700
5.	Private (including industrial)	6,200
6.	Unclassified, including allied fields	1,600
	Total	15,000

1. Includes foresters in overseas assignments, defense agencies, and miscellaneous federal resource activities.
2. Includes state highway, game, taxation, and parks agencies.
3. Includes recreation and shade-tree work.
4. Includes teaching in high schools, junior colleges, and education in general conservation.
5. Includes about 1,200 self-employed, consulting foresters and managers of non-industrially owned woodlands.
6. Includes foresters working in wildlife and range management, arboriculture, engineering, erosion control, manufacture and sale of forest products, and in research in those fields not otherwise classified above.

Compiled jointly November 10, 1953, by Society of American Foresters and American Forest Products Industries, Inc.

A Budworm Vigor-Resistance Classification For Spruce and Balsam Fir

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A spruce budworm epidemic again threatens the spruce-fir pulpwood forests of the Northeast. One defense against this insect is through silviculture. The author suggests selective-cutting methods to make spruce-fir stands more resistant, and offers a tree-classification system as a guide for selecting trees to cut or retain.

AFTER BEING QUIESCENT for more than 25 years, the spruce budworm (*Choristoneura fumiferana* [Clem.]) again threatens the spruce-fir forests of the Northeast. The insect has already swept over vast areas in Ontario and Quebec. Augmented by outbreaks to the east its progress eastward is continuing. It appears now that only the Atlantic Ocean can halt its eastward sweep.

In 1945 a sudden upsurge of the insect population developed in the Adirondacks and, to a lesser degree, in Vermont. Only a minor outbreak, it reached its peak the following year, then subsided rapidly. But soon afterward focal points of infestation began to appear in northern Maine. Aerial and ground surveys in 1950 disclosed more than 4 million acres under attack.

By 1951 the area under attack had decreased to 250,000 acres. But that same year witnessed a rapid build-up in neighboring New Brunswick, where areas defoliated enough so they could be mapped from the air totalled 2,200 square miles. This new outbreak and the continued eastward advance of the insect greatly increase the chance of large-scale moth flights into northern Maine. Thus the threat of a serious outbreak in Maine continues.

Considering the high values at stake, development of successful methods for controlling budworm outbreaks is of paramount importance. Under threat in the Northeast are some 19 million acres of forest containing more than 100 million cords of spruce-fir pulpwood. The dire consequences of a full fledged budworm epidemic to the pulp and paper industry and the region's economy scarcely needs mention. When the pulp and paper mills run into bad times so do the communities that depend upon them for their main source of employment.

Forest Management for Epidemic Control

The recent budworm outbreak in Canada and this country has again focused attention on the possibilities of forest management as a means of abating budworm losses. Investigators who have studied the problem generally agree that forest management offers the greatest promise for effective, inexpensive, and lasting treatment to prevent widespread losses from the insect.

Control of budworm epidemics through forest management embraces two phases:

1. The emergency phase, in which there is the pressing problem to abate losses where attacks are threatened. This can be accomplished through orderly pre-salvage logging aimed at cutting over as many high-hazard areas as possible before the insect causes serious damage.

2. The long-range program phase, in which there is the more complex problem of building up the resistance of spruce-fir stands to budworm attack. This can be accomplished through the adoption of cutting methods and stand improvement measures designed to control the factors that make stands highly susceptible.

But management goals call for more than merely putting stands in shape to repulse budworm attacks. Clear-cutting could probably accomplish this by reducing food and eliminating favorable breeding conditions. This is of a piece with burning the house down to get rid of termites. Forest management goals must recognize not only the need for conditioning stands to future budworm attack but also for bringing them into full production. For little or nothing is gained if attempts to attain resistance leave forests vulnerable to windthrow or other hazards that undermine their continued productivity. Methods of cutting must be developed that will most nearly maintain the proper balance between the goals of resistance and increased growth.

Need for a Guide to Resistance

To attain budworm-resistant stands the forester must know not only the type of trees to retain but also the types that, because of their proneness to severe injury and death, should be eliminated from the stand.

Thus increased stand resistance begins with consideration of individual trees. The better the forester is equipped to make a correct choice of trees the more effective the results will be and the faster will be the rate at which increased resistance and growth will be achieved.

What distinguishes a nonresistant tree from a resistant one? How can one identify highly resistant trees — or those of medium or low resistance? Under what conditions is a tree vulnerable?

Fortunately several characteristics believed to influence a tree's resistance are subject to classification. This points to the feasibility of developing a tree classification for spruce and fir that can be used as a guide for selecting the trees to be cut.

A number of successful tree classifications have been developed for American tree species in recent years. Among the earliest of these was one developed by Dunning *(2)* for ponderosa pine; it was based on age, degree of dominance, and crown development. Keen *(3, 6)*, noting marked differences among Dunning's tree classes in the sus-

[1] Mr. Westveld retired in December 1952.

ceptibility to beetle attack, used the same tree classes to evolve a bark-beetle-susceptibility classification. Hornibrook *(4)* successfully adapted Keen's classification, with slight modifications, to Black Hills ponderosa pine. Likewise Taylor *(9)* applied Keen's classification with success to lodgepole pine in Colorado and Wyoming. More recently Gevorkiantz, Rudolf, and Zehngraff *(3)* developed a tree classification for aspen, jack pine, and red pine.

The only attempts thus far to develop a tree classification for spruce and balsam fir in the Northeast have been some preliminary studies by Westveld *(11)* and McLintock *(7)*. Westveld recognized three vigor classes; he used external features as indicators of vigor or growth rate. McLintock went a step further and attempted to evaluate several of the more readily distinguishable features including crown class, crown ratio, and tree vigor. He succeeded in devising a rating scheme for appraising the combined influence of these three factors in terms of tree risk.

Why Stands Become Vulnerable

Before management techniques can be prescribed for changing budworm-vulnerable forests into forests capable of resisting damage, one needs to know what factors make a stand susceptible and vulnerable. A good insight into these factors can be gained by observing the degrees of damage different stands sustain under the same intensity of infestation. Such studies reveal wide variations among stands *(8)*. Some stands are highly susceptible and subject to serious damage; others resist attacks and weather them with only minor losses.

"Susceptibility" and "Vulnerability."—At this point it may be well to define the terms *susceptible* and *vulnerable*. The primary purpose in doing so is to clarify their use in this report.

A susceptible tree is one whose innate or inherited characteristics make it liable to attack by an injurious agent.

A vulnerable tree is one whose biological characteristics and external environment predispose it to appreciable injury or death when it is attacked.

Balsam fir, for example, has certain inherent characteristics that make it highly susceptible to budworm attack. One of these is its phenology, which is synchronized with the habits of the budworm; the buds expand shortly after the emergence of the overwintering larvae and provide food for the budworm when it needs it most. Another is the palatability of its needles — both old and new — to the insect. On the other hand, black spruce rates low in susceptibility because only the current year's foliage is palatable; moreover its buds normally do not burst until 10 or more days after the insect emerges.

Vulnerability implies liability to injury. Although high vulnerability is usually associated with high susceptibility, it does not follow that all vulnerable trees are highly susceptible or that highly resistant trees can be counted on to escape serious damage. In fact a highly resistant tree, by reason of its location or other factors, may be extremely vulnerable. For example, a young, dominant, thrifty balsam fir may be more vulnerable to budworm damage than a slower-growing intermediate or overtopped tree because of its greater exposure to attack and egg deposition. Nevertheless, under uniform intensities of feeding the dominant balsam fir, because of its greater vigor, has a better chance of survival and quick recovery than the less resistant intermediate and overtopped tree.

The two terms can be applied to stands as well as to individual trees. The susceptibility of a stand is controlled by its composition. Therefore, a stand's susceptibility is the sum of the susceptibility of the trees comprising it. Then the degree to which a stand's composition makes it liable to attack is a measure of its susceptibility.

The vulnerability of a stand refers to the degree to which its susceptibility and environment predispose it to damage. Thus it appears that degree of expected damage is the product of susceptibility and vulnerability.

Species and vulnerability.—The two most potent factors that influence the severity of budworm damage to a stand are the stand's species composition and its vigor.

Balsam fir is the species that suffers most; it is the favored host tree. Highly vulnerable stands normally have a large representation of this species.

The spruces (red, white, and black) are less apt to suffer serious damage. Stands in which these species greatly outnumber balsam fir generally have a large degree of resistance. However, the spruces may suffer severe defoliation — particularly when growing in mixture with considerable quantities of balsam fir. Black spruce, although heavily infested, is seldom killed. Generally less damage occurs where susceptible species are well interspersed with hardwoods that provide a protective overstory.

For both balsam fir and the spruces, stagnant, old, or slow-growing stands are both susceptible and vulnerable. The older the stand and the less its thrift, the greater the danger of severe defoliation and loss. But young, fast-growing stands of both species have a good chance of weathering epidemics with relatively light losses.

Significance of tree vigor.— Numerous instances can be cited of the importance of stand thrift in forestalling budworm damage. Stands have been encountered in heavily infested areas that, despite containing high proportions of balsam fir, nevertheless escaped serious injury. In all instances these nearly pure balsam fir stands were young and thrifty; generally they were less than 40 years old. The trees comprising such stands had dense, thrifty, well-developed crowns. Moreover, they were growing vigorously — as attested by wide growth rings and long terminal and lateral growths. The heavily damaged surrounding stands, on the other hand, were dominated by mature trees long past their prime.

Further evidence that vigor is an important factor in a stand's ability to survive budworm attacks

was revealed in studies made recently in balsam fir stands subjected to heavy feeding by budworms during the 1910-1920 outbreak in Maine. Sample sections were removed from a number of surviving trees and their growth patterns were analyzed. All the samples showed relatively wide growth rings prior to attack, evidence that the tree possessed a high degree of vigor at the time of the outbreak.

For example, a 9-inch balsam fir chosen for its apparent vigor showed a growth rate before attack of 1 inch in 4 years. During the 6-year period of attack and recovery the tree grew at the rate of only 1 inch in 16 years (Fig. 1). For 13 years after recovery, the tree grew at the rate of 1 inch in 6 years. In the succeeding 9 years, however, because of increased stand density, growth slowed down to approximately 1 inch in 10 years.

Ring counts indicated that the sampled trees averaged between 25 and 30 years of age at the time of the budworm outbreak. These trees were able to survive the attack with no apparent damage beyond the loss of increment — indicated by the series of 5 to 6 retarded rings laid down during, and for a short period following, the outbreak. On the other hand, sections taken from trees that died as a result of the outbreak invariably showed signs of slow growth preceding attack, followed by increasingly narrower growth rings and final death of the tree.

Similar studies conducted by Craighead *(1)* in 1923 near Bathhurst, New Brunswick, corroborate these observations. He compared the 10-year growth rate just before attack of groups of trees that succumbed to feeding as well as those that survived. The average rate of growth of balsam fir survivors was 1 inch in 7 years compared with 1 inch in 13 years for those that were killed. For white spruce, divergence of growth rate between survivors and killed trees was even greater — 1 inch in 11 years and 29 years respectively. For red spruce the corresponding figures were 11 and 14 years.

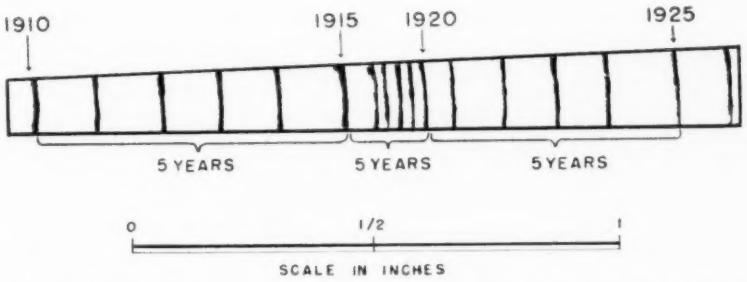

FIG. 1.—Sketch of a transverse section cut from a balsam fir tree that had suffered a budworm attack. The annual rings show rapid growth before the attack, a sharp reduction in growth during the period of budworm attack, then a resumption of normal growth after recovery. The tree from which this section was taken grew in Kennebago, Maine. The section was cut slightly below breast height.

Vigor may well outweigh species in importance. For example, although red spruce is inherently less susceptible to attack than balsam fir, an extremely vigorous balsam fire may prove more resistant than a red spruce of low vigor. Moreover, one must recognize that the extent to which vigor controls degree of damage will depend upon the intensity of the budworm attack. When the attack is light, even trees of medium or low vigor may survive with only minor increment losses. When the attack is heavy, even superior vigor may not suffice to forestall serious damage.

To obtain more information about the role species and tree vigor play in stand resistance, the Northeastern Forest Experiment Station, in cooperation with the Bureau of Entomology and Plant Quarantine is studying about 2,000 trees of different species, age, size, and vigor in conjunction with such factors as intensity of attack, stand composition, and stand density. Observations will be continued beyond the active outbreak period to determine how successfully various trees recover from the effects of budworm feeding. Ultimately this information should provide the basis for determining the minimum scale of stand vigor essential for satisfactory stand recovery under varying intensities of attack.

A Study of Growth-Vigor Relationships

Much basic information essential to a successful spruce-fir tree classification is already available. Certain growth-vigor relationships have been established through analyses of large numbers of increment cores from spruce and balsam fir trees.

Most of the increment cores studied were obtained from trees on some 400 experimental plots established throughout the spruce-fir region of the Northeast in two broad classes of spruce lands: dominant spruce-fir types and secondary spruce-fir types. The former class supports mainly conifers, the latter conifers with considerable admixtures of northern hardwoods. The plots were distributed to represent a wide variety in forest type, site quality, age, and stand composition. The trees sampled represented a wide assortment of size classes—from 1 to 20 inches d.b.h.

For each tree the following was determined: species, d.b.h. to the nearest 1/10 inch, total height, crown length and width, dominance class, and degree of release. All trees were bored to sufficient depth to sample not only their growth after release but also for 10 years before.

All of the subsequent growth analyses were based on these tree data with the exception of the maturity-growth analyses. The data were not suitable for this purpose since total age had been determined for only a few of the sample trees. The maturity-growth analysis was based on measurements of 162 black spruce and 110 balsam fir obtained from the late W. M. Robertson, formerly chief of silvicultural research, Dominion of Canada Forest Service. The sam-

TABLE 1.—DISTRIBUTION OF SPRUCE INCREMENT SAMPLES BY VIGOR CLASSES

Vigor class	D.b.h. growth by 5-year periods	Dominant Spruce-fir types			Secondary Spruce-fir types		
	Inches	*No. of samples*	*Percent*	*Cumulative percent*	*No. of samples*	*Percent*	*Cumulative percent*
	0.1	433	7.8	7.8	589	19.1	19.1
3	.2	820	14.8	22.6	568	18.5	37.6
	.3	845	15.3	37.9	467	15.2	52.8
	.4	770	13.9	51.8	399	13.0	65.8
2	.5	644	11.7	63.5	300	9.7	75.5
	.6	612	11.1	74.6	252	8.2	83.7
	.7	381	6.9	81.5	156	5.1	88.8
	.8	367	6.7	88.2	105	3.4	92.2
	.9	190	3.4	91.6	68	2.2	94.4
	1.0	206	3.7	95.3	76	2.5	96.9
	1.1	96	1.7	97.0	32	1.0	97.9
	1.2	91	1.7	98.7	21	.7	98.6
	1.3	15	.3	99.0	16	.5	99.1
	1.4	30	.5	99.5	7	.2	99.3
	1.5	8	.2	99.7	5	.2	99.5
	1.6	7	.1	99.8	7	.2	99.7
1	1.7	2	—	—	3	.1	99.8
	1.8	5	—	—	3	.1	99.9
	1.9	—	—	—	—	—	—
	2.0	1	—	—	2	.1	100.0
	2.1	—	.2	100.0	—	—	—
	2.2	2	—	—	—	—	—
	2.3	—	—	—	—	—	—
	2.4	1	—	—	—	—	—
	Total	5,526	100.0	—	3,076	100.0	—

TABLE 2.—DISTRIBUTION OF BALSAM FIR INCREMENT SAMPLES BY VIGOR CLASSES

Vigor class	D.b.h. growth by 5-year periods	Dominant Spruce-fir types			Secondary Spruce-fir types		
	Inches	*No. of samples*	*Percent*	*Cumulative percent*	*No. of samples*	*Percent*	*Cumulative percent*
	.1	125	4.4	4.4	193	11.6	11.6
3	.2	277	9.7	14.1	221	13.3	24.9
	.3	375	13.2	27.3	201	12.1	37.0
	.4	326	11.4	38.7	160	9.6	46.6
	.5	329	11.5	50.2	151	9.1	55.7
	.6	291	10.2	60.4	145	8.7	64.4
2	.7	217	7.6	68.0	135	8.1	72.5
	.8	229	8.0	76.0	115	6.9	79.4
	.9	138	4.8	80.8	68	4.1	83.5
	1.0	169	5.9	86.7	66	4.0	87.5
	1.1	83	2.9	89.6	52	3.1	90.6
	1.2	108	3.8	93.4	46	2.8	93.4
	1.3	36	1.3	94.7	35	2.1	95.5
	1.4	66	2.3	97.0	28	1.7	97.2
	1.5	16	.6	97.6	9	.6	97.8
	1.6	27	1.0	98.6	19	1.2	99.0
1	1.7	13	.5	99.1	3	.2	99.2
	1.8	13	.5	99.6	4	.2	99.4
	1.9	1	—	—	5	.3	99.7
	2.0	9	—	—	2	.1	99.8
	2.1	—	—	—	—	—	—
	2.2	1	.4	100.0	2	.1	99.9
	2.3	—	—	—	—	—	—
	2.4	1	—	—	—	—	—
	2.5	—	—	—	1	.1	100.0
	2.6	2	—	—	—	—	—
	Total	2,852	100.0	—	1,661	100.0	—

pled trees occurred in the so-called "mixed type" in which black spruce and balsam fir occur in mixture with occasional white spruce, white pine, and white-cedar together with such hardwoods as white birch, aspen, and red maple.

The spruce cores (red spruce) studied totalled 1 091, balsam fir 720. The period encompassed by these cores extends roughly from 1845 to 1925. Thus a sufficient period of time is involved to nullify the effects of variations in climatic conditions. Increment readings were made by 5-year periods; so 8,169 spruce and 4,145 balsam fir readings were available for growth analysis.[2]

Following this analysis, increment-frequency-distribution tables were compiled for spruce and balsam fir, by 1/10-inch growth classes (Tables 1 and 2). Apparently balsam fir displays a slightly wider range in growth than spruce. Diameter increments of balsam fir range up to 2.6 inches in a 5-year period against a maximum of 2.4 inches for spruce (Table 1). Growth rates range from the slow pace of 1 inch in 50 years to a maximum of 1 inch in slightly less than 2 years. If diameter growth is a reflection of tree vigor, the data indicate that this attribute varies widely among individual trees.

Vigor Classes Based on Growth Rate

It is generally believed that a tree's rate of growth is a reliable measure of its vigor, for in the last analysis increment is a composite of all the factors that influence tree vigor. True, distribution of diameter growth in a tree is not uniform throughout its bole; and it varies among trees. And there are instances of trees with butt rot or other defects that, nevertheless, show fair to good diameter growth. However, for practical purposes these variations may be disregarded and diameter growth at breast height can be used safely as a basis for determining vigor.

On this premise, three vigor classes were established for each species. The limits for each vigor class were set arbitrarily; they were based on the frequency dis-

[2]These are slightly at variance with the total spruce and balsam fir readings recorded in Table 1 and Table 2. A correction factor was applied to the dominant spruce-fir series to place it on a parity with the secondary spruce-fir series.

tributions of the 5-year growth increments (Tables 1 and 2). It then became a simple matter to calculate average growth rate for each vigor class (Table 3).

To qualify as a Vigor 1 tree a spruce must grow at least 0.8 inch in a 5-year period (Table 3). Limits of growth for Vigor 2 spruces in a like period range from 0.4 to 0.7 inch inclusive. Vigor 3 spruces in an equal period grow less than 0.4 inch. Growth rates of spruce in the three vigor classes average 1 inch in 5 years, 1 inch in 10 years, and 1 inch in 25 years respectively.

Note that slightly higher growth limits have been set for balsam fir[3] (Table 3). A Vigor 1 tree of this species must grow a minimum of 1.0 inch in diameter in a 5-year period. For Vigor 2 the limits are 0.5 to 0.9 inch and for Vigor 3 trees less than 0.5 inch in a 5-year period. Growth rates for the corresponding vigor classes average 1 inch in 4 years, 1 inch in 8 years, and 1 inch in 19 years.

TABLE 3.—AVERAGE GROWTH RATES USED TO DETERMINE VIGOR CLASSES

Vigor class	D.b.h. increment rate: Spruce, For 5-year period, Range	Spruce, Average of class	Spruce, Years to grow 1 inch (average)	Balsam fir, For 5-year period, Range	Balsam fir, Average of class	Balsam fir, Years to grow 1 inch (average)
	Inches	*Inches*	*Number*	*Inches*	*Inches*	*Number*
1	0.8 plus	0.98	5	1.0 plus	1.24	4
2	.4 - .7	.52	10	.5 - .9	.66	8
3	Less than .4	.20	25	Less than .5	.26	19

Factors That Influence Tree Vigor

Since a tree's capacity to resist damage from the budworm is so closely linked with vigor, the silviculturist must be able to identify the various vigor classes with reasonable accuracy. His problem is largely to determine outward tree characteristics that are indicative of the tree's condition. Preliminary studies reveal salient features that permit fairly consistent vigor appraisals. Among the more important of these are maturity, dominance, and crown length.

Maturity.—To get a measure of the effect of maturity on growth rate, increment data for balsam fir and spruce were analyzed on the basis of age classes segregated into maturity groups. Note (Table 4) that maximum growth for both spruce and balsam fir occurs in the young age class. Average growth rate starts to decline when the trees reach maturity; it falls off rapidly as they become overmature. For example, young spruce grows at the rate of 0.8 inch in a 5-year period as compared to 0.45 inch and 0.20 inch for mature and overmature trees respectively. The growth drop in balsam fir is even greater; the corresponding rates are 1.00, 0.50, and 0.15 inches respectively.

Dominance.—The effect of tree dominance on growth rate was also analyzed using the same groups of trees that provided the basis for Tables 1 and 2. Three dominance classes were recognized: (1) Dominant, consisting of both dominant and codominant trees, (2) intermediate, and (3) overtopped, including both overtopped and suppressed trees.

The results of this analysis (Table 4) show that average dominants grow about a third faster than the average intermediates and nearly twice as fast as overtopped trees. Unfortunately the sample trees comprising the three age groups were not recorded by crown classes. But it appears fair to assume that, since growth rate declines with increase in age, the average growth rate for any crown class in a young stand will be greater than for the corresponding crown class in a mature or overmature stand.

Crown length.—Influence of crown length on growth rate was also analyzed. Five-year growth averages of spruce and balsam fir were determined (Table 4) for three classes of crown lengths: Long (70 percent or more of the bole length in crown); medium (40 to 70 percent); and short (less than 40 percent).

The results show that increase in crown length is accompanied by an increase in growth rate. For example, the diameter growth for long-crowned trees is 40 percent greater than for medium-crowned trees, and more than 100 percent greater than for short-crowned trees. Comparison indicates that crown length and tree dominance exert nearly equal influence on growth rate.

Further evidence that growth is strongly influenced by tree dominance is shown in Table 5. Growth rates for all crown-length classes are consistently greater in the dominant class than in the intermediate and overtopped classes. For example, the average 5-year diameter growth for medium-crowned spruce classed as dominant is 0.58 inch in contrast to 0.41 and 0.29 inch for those in the intermediate and overtopped classes.

The importance of tree dominance is further emphasized by comparing the distribution pattern of vigor classes among the dominance classes (Table 6). For both spruce and balsam fir the percentage of high-vigor trees was greatest in the dominant group. For example, 30 percent of all dominant spruces proved to be Vigor 1 trees. For intermediate and overtopped

TABLE 4.—RELATIVE GROWTH RATES OF SPRUCE AND BALSAM FIR BY MATURITY, DOMINANCE, AND CROWN LENGTH
(Diameter growth in 5-year period)

Item	Spruce	Balsam fir
	Inches	*Inches*
Maturity:		
Young	0.80	1.00
Mature	.45	.50
Overmature	.20	.15
Dominance:		
Dominant	.56	.68
Intermediate	.42	.52
Overtopped	.30	.38
Crown length:		
Long	.58	.73
Medium	.42	.50
Short	.28	.35

[3] That balsam fir grows at a significantly faster rate than spruce was conclusively established through statistical analysis of the increment-core data. Using the formula for the standard error of the difference between two values it was found that the growth differences between the means of spruce and balsam fir are far above the 0.01 level of significance.

TABLE 5.—RELATION OF TREE DOMINANCE TO CROWN LENGTH IN GROWTH RATES OF SPRUCE AND BALSAM FIR
(Diameter growth in 5-year period)

Crown-length class	Dominant		Intermediate		Overtopped	
	Spruce	Fir	Spruce	Fir	Spruce	Fir
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Long	0.70	0.88	0.59	0.73	0.46	0.58
Medium	.58	.67	.41	.47	.29	.37
Short	.40	.50	.28	.35	.16	.20

TABLE 6.—PROPORTION OF SAMPLE TREES IN THE VARIOUS VIGOR CLASSES, BY DOMINANCE CLASS AND CROWN-LENGTH CLASS

Item	Spruce			Balsam fir		
	Vigor 1	Vigor 2	Vigor 3	Vigor 1	Vigor 2	Vigor 3
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Dominance class:						
Dominant	30	54	16	28	54	18
Intermediate	8	45	47	6	48	46
Overtopped	4	28	68	5	19	76
Crown-length class:						
Long	31	54	15	34	52	14
Medium	17	48	35	12	47	41
Short	4	30	66	3	23	74

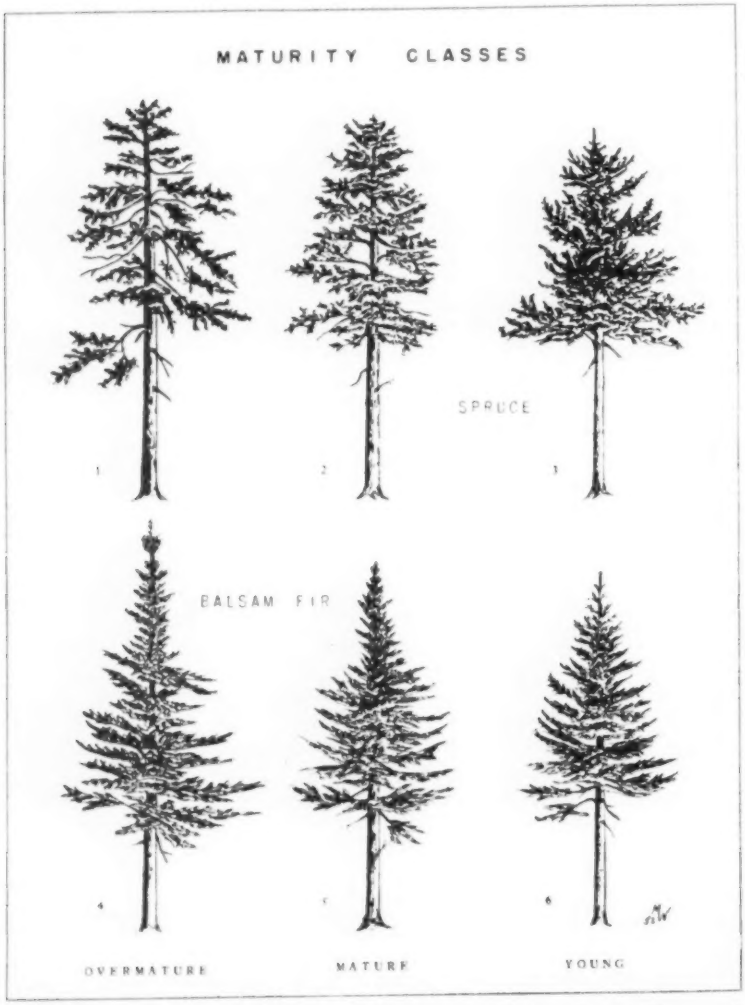

FIG. 2.—Maturity classes used in appraising spruce and balsam fir trees for growth potential and resistance to budworm attack.

species only 8 and 4 percent, respectively, were so classed. Corresponding percentages for balsam fir are 28, 6, and 5.

Other factors. — It is evident (Table 6) that neither tree-dominance classes nor crown-length classes are identical with vigor classes — though there is a trend toward correlation. Dominant spruce and balsam fir contain the highest proportion of Vigor 1 trees (28 to 30 percent) and the lowest proportion of Vigor 3 trees (16 to 18 percent). Overtopped spruce and fir, on the other hand, have the largest proportion of Vigor 3 trees (68 to 76 percent) and the lowest proportion of Vigor 1 trees (4 to 5 percent).

Lack of fuller correlation between tree dominance and growth is partly attributable to the rigidity of the classification set up for the factors chosen to identify tree classes. For instance, in a stand newly cut over many trees will be dominant, not by virtue of their superior growth rate but simply because the trees that had been overtopping them had just been removed.

A similar degree of correlation exists between crown-length classes and vigor classes (Table 6). Of long-crowned spruce and balsam fir, 31 to 34 percent classify as Vigor 1, 52 to 54 percent as Vigor 2, and 14 to 15 percent as Vigor 3. Only 3 to 4 percent of trees with short crowns are in Vigor 1 but 66 to 74 percent fall in Vigor 3.

Other crown factors than length (density and width) affect rate of growth. Competition, drainage, soil depth, and fertility obviously play their parts too.

A Tree-Classification System

From these growth and vigor relationships a system was developed for classifying spruce and fir trees according to their ability to resist budworm attack (Table 7). Maturity, dominance, and crown length were used as criteria in this system. These three tree characteristics can be easily recognized and appraised.

The major breakdown is into three age groups: Young, mature, and overmature. Within each age

group are three dominance classes: Dominant, intermediate, and overtopped. Dominance classes in turn are subdivided into three crown-length classes: Long, medium, and short. Thus a total of 27 tree classes are recognized. The salient features of these tree classes are illustrated in Figures 2 to 5.

On the assumption that rate of growth is a reliable measure of vigor and that vigor in turn is a measure of resistance, vigor-resistance ratings were assigned to these tree classes. These ratings range from a maximum resistance of 10 to a minimum of 0.

According to this classification the most resistant and vigorous trees are young dominants that have long crowns; those lowest in the scale are the over-mature specimens in the overtopped-crown classes with short crowns.

Note that an interval of 3 units in the vigor-resistance scale separates like tree classes in the three maturity groups. The magnitude of this interval presumably expresses the steep decline in growth rate (Table 4) that accompanies increase in age. The decline that accompanies reduction in length of crown, however, is much less drastic, as is also true of change in crown class. Hence an interval of only 1 point appears adequate to express the growth-rate decline between dominance classes for trees of uniform crown length.

Absolute accuracy is not claimed for these vigor-resistance ratings. The intervals separating the various tree classes may be either too great or too small. However, indications are that their relative ratings are approximately correct. Continued research will eventually pinpoint the ratings more exactly for these and other tree classes. The present classification is only a stop-gap measure until more accurate data make it obsolete.

To tie external tree characteristics and tree vigor more closely together, the 27 tree classes have been allocated (Table 8) among the three vigor groups earlier described. Tree classes within each vigor group were ranked in accordance with their vigor-resistance capacity as determined by their average growth rates.

TABLE 7.—SPRUCE FIR TREE CLASSES RATED FOR GROWTH AND RESISTANCE CAPACITIES

Young trees		Mature trees		Overmature trees	
Tree dominance and crown length	Vigor-resistance rating	Tree dominance and crown length	Vigor-resistance rating	Tree dominance and crown length	Vigor-resistance rating
Dominant:[1]		Dominant:[1]		Dominant:[1]	
Long crown	10	Long crown	7	Long crown	4
Medium crown	9	Medium crown	6	Medium crown	3
Short crown	8	Short crown	5	Short crown	2
Intermediate:		Intermediate:		Intermediate:	
Long crown	9	Long crown	6	Long crown	3
Medium crown	8	Medium crown	5	Medium crown	2
Short crown	7	Short crown	4	Short crown	1
Overtopped:[2]		Overtopped:[2]		Overtopped:[2]	
Long crown	8	Long crown	5	Long crown	2
Medium crown	7	Medium crown	4	Medium crown	1
Short crown	6	Short crown	3	Short crown	0

[1]Comprises both dominant and codominant tree classes.
[2]Comprises both overtopped and suppressed trees classes.

Certain tree classes within a given vigor group have the same numerical rating. For example,

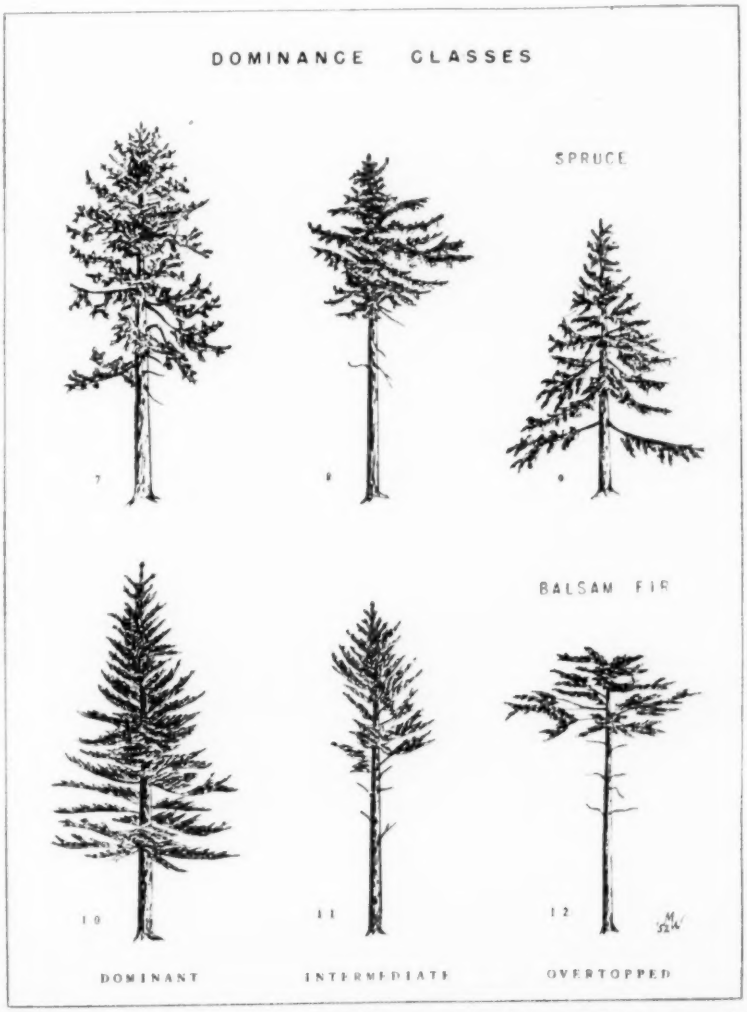

FIG. 3.—Dominance classes used in appraising spruce and balsam fir trees for growth potential and resistance to budworm attack.

mature dominants with short crowns, mature intermediates with medium-length crowns, and mature overtopped trees with long crowns have a uniform vigor-resistance index of 5.

The assumption that these tree classes are on a parity appears justified on the basis of the growth curves shown in Figure 6. According to this graph, dominant balsam firs with short crowns (a median crown ratio[4] of 0.2) grow 0.5 inch in a 5-year period; intermediates with medium-length crowns (a median crown ratio of 0.5) grow 0.52 inch; and overtopped balsam firs with long crowns (a median crown ratio of 0.8) grow 0.54 inch. Presumably tree classes of equal rating, other things being equal, have equal opportunities for survival and growth.

The tree-classification table (Table 8), however, is far from being infallible. Trees seldom conform fully to the artificial patterns devised by man. It is entirely likely, for example, that resistance ratings in any given tree class may vary by as much as 1 or 2 points. Nor is this surprising: trees of uniform age, dominance, and crown length may still differ enough in crown width, density, and other features to cause marked deviations in growth from the mean.

Thus it is conceivable that trees whose outward characteristics classify them as Vigor 1 have actual growth rates that justify only a Vigor 2 rating. For example, young intermediates with medium-length crowns are shown in Table 8 as Vigor 1 trees with a resistance rating of 8. Included in this class may be specimens with narrow, thin-foliaged crowns whose consequent slower growth rates justify only a Vigor 2 classification and a resistance rating of 7 or less.

The influence of such factors has been taken into consideration in the preparation of Table 9, which shows the estimated vigor-resistance of each tree appearing in Figures 2 to 5. For example, Trees 12 and 18 are both classed as young overtopped trees with short crowns. Thus, according to Tables 7 and 8 both should rate a vigor-resistance index of 6. But Tree 12 has a thin crown in contrast to Tree 18's medium-density crown; therefore Tree 12 has been assigned an index rating of 5. If, in addition to possessing a thin crown, its crown were narrow instead of wide, one might be justified in reducing the index to 4.

Although the relative vigor-resistance ratings apply equally to spruce and balsam fir, it does not follow that balsam firs and spruces with uniform ratings have equal resistance capacities. Balsam fir, as emphasized earlier, is inherently more susceptible to budworm attack than spruce. Hence attainment of a given level of resistance calls for higher ratings in this species than in spruce. For example where a rating of 5 for spruce may suffice to forestall serious after-effects from budworm feeding, a rating of 8 for balsam fir may be required to assure equally good results.

Despite these weaknesses this tree-classification system can be of material aid in the application of management methods aimed at reducing budworm losses, building up stand resistance to future attacks, and leaving the stand in the best possible condition for future growth. But where the latter objective includes the production of high-grade sawlogs, quality be-

[4]The ratio of live crown length to total tree height.

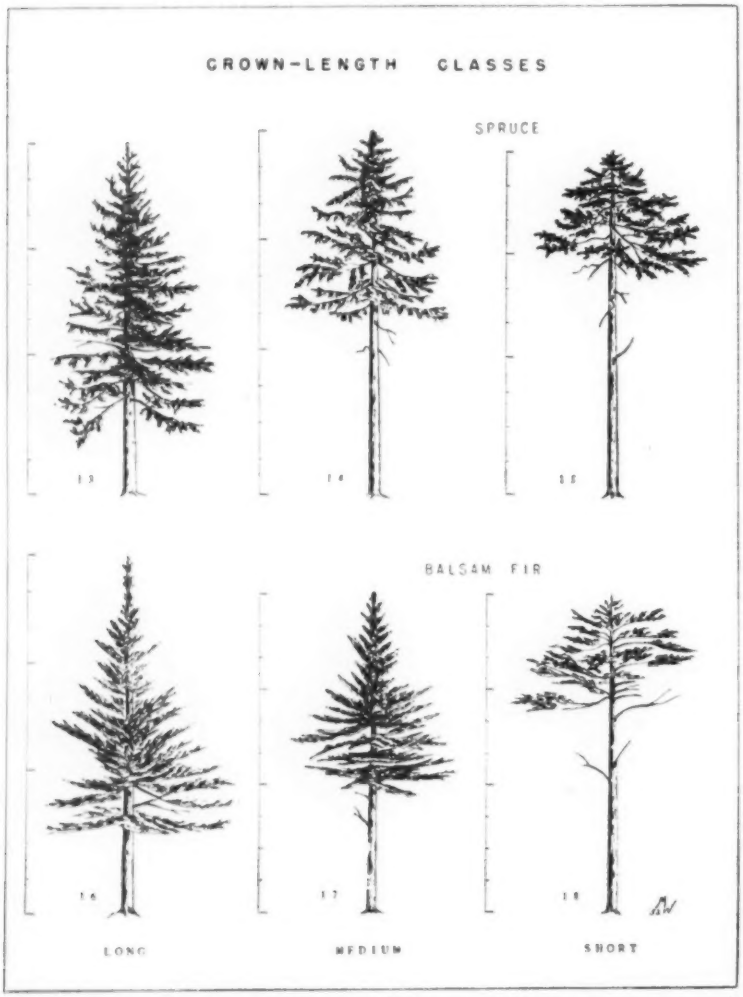

FIG. 4.—Crown-length classes used in appraising spruce and balsam fir trees for growth potential and resistance to budworm attack. The scales shown beside the trees are for use in estimating the percentage of bole length in crown.

comes another important consideration.

Thus, if a stand were being marked with an eye to quality, vigor-resistance ratings should not be applied without adjustment. For example, a young dominant spruce with a short-crown — other things being equal — contains a higher proportion of clear lumber than a tree that bears branches along the greater portion of its bole. Thus, a short-crowned tree—despite its slower growth — would rate a higher quality index than a long-crowned specimen.

Undoubtedly a quality-index rating could be developed following more study of factors affecting tree grade. The present ratings were not designed to accomplish this. Their main value lies in providing the forester with a basis for selecting trees that have high resistance and growth potentials.

Techniques for Classifying Trees

Most of the factors used in this method of classifying spruce-fir trees are subject to fairly accurate appraisal.

Evaluating Maturity

Several outward characteristics help in identifying maturity class. One is the appearance of the bark (Figs. 7 and 8).

The bark of a young spruce is thin, and is broken into flaky, ashy-brown scales. With increases in age the bark darkens and separates into thin, loosely attached plate-like scales. In old trees the bark becomes thickened and ridged and assumes a reddish brown hue.

Balsam fir when young has thin, smooth, shiny bark mottled with grayish-green patches and numerous projecting resin blisters. With age the bark thickens and resin blisters diminish in number. In old trees, though the bark remains unfurrowed, it becomes roughened by the formation of small irregular plates and assumes a dull ashy-gray to reddish-brown color.

Crown characteristics also aid in identifying the maturity of spruce and balsam fir. Young trees of both species show good height growth and have symmetrical, cone-shaped crowns with branches definitely upturned for the greater portion of the crown (Fig. 2, Tree 3 and Tree 6).

As spruce reaches maturity, height growth practically ceases: the tree loses its extreme conical shape, often becoming somewhat rounded; upturned branches are limited to the extreme top. In overmature spruce the top is definitely rounded or flat, branches are horizontal or drooping. (Fig. 2, Tree 1 and Tree 2; Fig. 5, Tree 23).

In mature balsam fir, height growth proceeds slowly; the crown is typically spire-topped with short lateral branches (Fig. 2, Tree 5). The crowns of overmature specimens range from rounded or flat tops (in overtopped specimens) to those distinctly spire-shaped (Fig. 2, Tree 4). Branches droop; usually they are thick and short.

Evaluating Dominance

Less agreement may be expected in appraisal of tree dominance. Probably the best clue to correct identification of dominance is the degree to which the tree's crown is free of pressure from its associates.

This is largely determined by the height of the tree in relationship to the canopy level and its position with respect to neighboring trees. Thus trees that have more than one-half of their crowns exposed to full sunlight may be

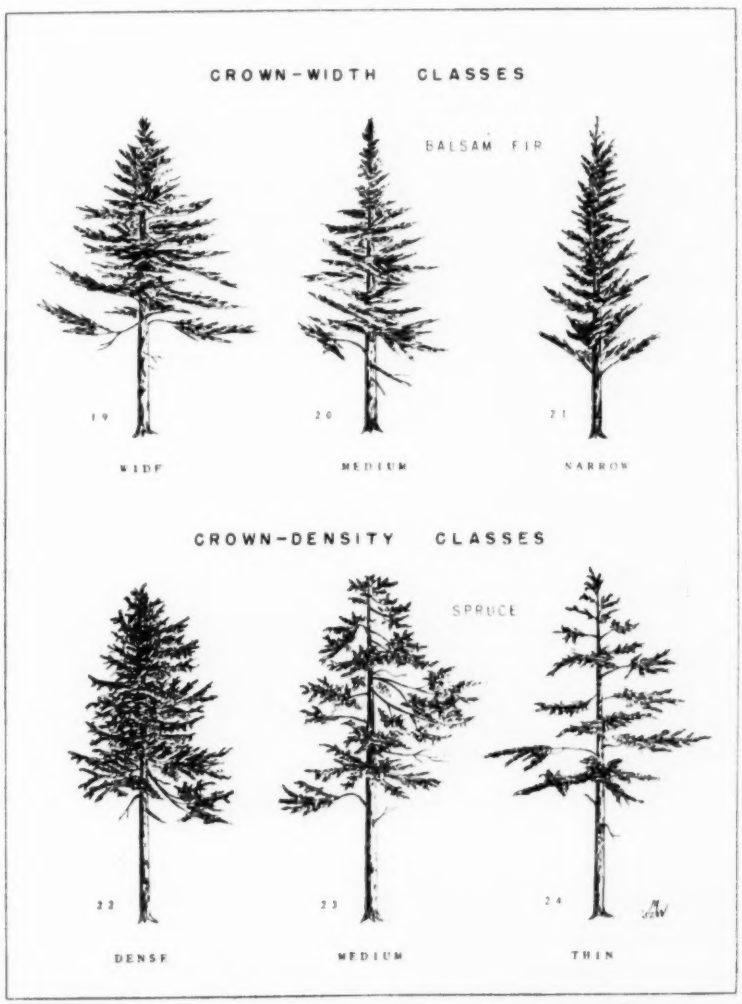

FIG. 5.—Range in crown-width and crown-density classes. Density and width of crown influence the growth and budworm-resistance potentials of spruce and balsam fir trees.

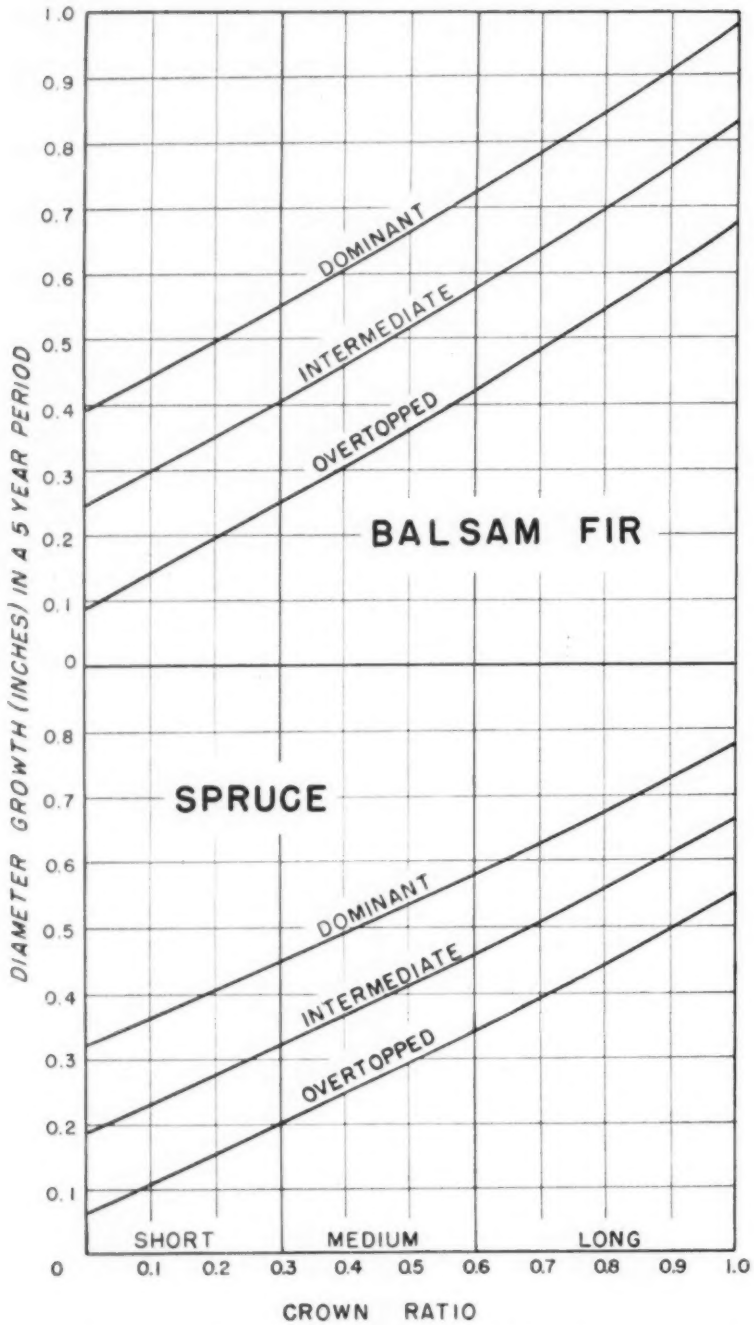

FIG. 6.—Relationship of diameter growth of spruce and balsam fir to crown length, by dominance classes.

classed as dominants and codominants, those up to one-half as intermediates, and those receiving no direct overhead light as overtopped and suppressed (Fig. 3).

Evaluating Crown Length

Since crown length is subject to accurate measurement there should be little disagreement in evaluating this factor. For the purpose of this classification a long crown is one that constitutes 70 percent or more of the bole length, a medium crown 40 to 70 percent, and a short crown less than 40 percent (Fig. 4).

Use of Vigor Classes

The features that help to distinguish one tree class from another are sufficiently distinctive to provide an acceptable basis for defining the three vigor classes recognized in the tree classification. The descriptions of the vigor classes are included for their informational value and not as an additional factor to be used in appraising a tree's resistance rating.

Vigor 1.—Trees in this class have well-developed but not necessarily symmetrical crowns. Usually they are dominants and codominants. However, intermediates and occassionally overtopped and suppressed trees—if favored with long, dense crowns—may grow rapidly enough to rate as Vigor 1 trees. Crowns are normally pointed, branches of the upper portion of the crown are upturned, foliage is dense and of good color, and the bark is smooth and thin. Lateral branches as well as terminals show excellent growth.

Vigor 2.—Trees in this class can be put into two categories: (1) those with crowns similar to Vigor 1 trees in form but which because of greater age, unfavorable position, and other unfavorable growth factors, are making considerably less lateral and terminal growth; (2) those with les-well-developed crowns than Vigor 1 trees. These frequently have dense, short, somewhat rounded crowns with good growing terminals or relatively long conical crowns with thin foliage and only fair terminal growth.

The bark of Vigor 2 balsam fir has lost the shiny smoothness that typifies Vigor 1 trees. The bark of the spruces is thicker and rougher than that of Vigor 1 trees. Vigor 2 trees are by no means restricted to intermediate crown classes. Many dominants, particularly in the older age classes, fall into this vigor class.

Vigor 3.—Trees of this class fall into several categories. One consists of trees with deformed or poorly developed crowns. Typical of this sort are the short but wide-crowned trees with flat or rounded tops—so-called "umbrella" tops.

Then there are the mature and overmature trees that possess fairly long and even dense crowns but, because of approaching senility, are growing slowly as evidenced by cessation in height growth and slowly growing laterals. There are also long-crowned Vigor 3 trees that, owing to sparse foliage and unfavorable stand position, are currently incapable of rapid growth.

Vigor 3 trees normally have horizontal or drooping branches. In spruce the bark of such trees is thick, usually it is ridged and fissured; in balsam fir numerous small plates develop, imparting a rough surface to the bark. These characteristics are pronounced in overmature specimens (Fig. 7).

Resistance Cutting Methods

Surveys show that extensive areas in the spruce-fir region of the Northeast now are higly susceptible and vulnerable to budworm attack. This unfavorable situation, in a large measure, stems back to previous budworm epidemics and to improper cutting methods practiced in the past.

Studies conducted by the Northeastern Forest Experiment Station (*10*) show that widespread use of clear-cutting has favored abundant regeneration of balsam fir, a species highly susceptible to budworm attack. Moreover, under the long cutting cycles inherent to the clear-cutting method the abundant, short-lived balsam fir reach maturity, loose vigor, and develop defect before the area is ready to cut again.

It seems, then, that budworm control is largely a silvicultural problem that should be solved through forest management. Through cutting methods forest managers should be able to create forest conditions highly unfavorable to the budworm. Cutting methods should be developed that will assure conversion of mixed balsam fir-spruce forests to predominantly spruce and will maintain vigorous growing stock.

Past studies indicate that selection cutting tends to reduce the balsam fir component. And since selection cutting means short-cycle cutting—and thus frequent opportunities for eliminating balsam fir and unthrifty trees—it should be used to achieve the objectives that make for resistant forests: good stand vigor and low concentrations of balsam fir.

TABLE 8.—RELATIVE VIGOR RESISTANCE RATINGS OF SPRUCE-FIR BY GROUP CLASSES

Group class	Tree class	Tree class symbol	Vigor-resistance index
High resistance Vigor 1	Young dominants with long crowns	YDCl	10
	Young dominants with medium crowns	YDCm	9
	Young intermediates with long crowns	YICl	9
	Young dominants with short crowns	YDCs	8
	Young intermediates with medium crowns	YICm	8
	Young overtopped with long crowns	YOCl	8
Medium resistance Vigor 2	Young intermediates with short crowns	YICs	7
	Young overtopped with medium crowns	YOCm	7
	Mature dominants with long crowns	MDCl	7
	Young overtopped with short crowns	YOCs	6
	Mature dominants with medium crowns	MDCm	6
	Mature intermediates with long crowns	MICl	6
	Mature dominants with short crowns	MDCs	5
	Mature intermediates with medium crowns	MICm	5
	Mature overtopped with long crowns	MOCl	5
Low resistance Vigor 3	Mature intermediates with short crowns	MICs	4
	Mature overtopped with medium crowns	MOCm	4
	Overmature dominants with long crowns	O-MDCl	4
	Mature overtopped with short crowns	MOCs	3
	Overmature dominants with medium crowns	O-MDCm	3
	Overmature intermediates with long crowns	O-MICl	3
	Overmature dominants with short crowns	O-MDCs	2
	Overmature intermediates with medium crowns	O-MICm	2
	Overmature overtopped with long crowns	O-MOCl	2
	Overmature intermediates with short crowns	O-MICs	1
	Overmature overtopped with medium crowns	O-MOCm	1
	Overmature overtopped with short crowns	O-MOCs	0

TABLE 9.—ESTIMATED VIGOR-RESISTANCE INDEX OF ILLUSTRATED GUIDE TREES (FIGURES 2 TO 5) BASED ON THEIR OUTWARD CHARACTERISTICS

Tree No.	Maturity class	Dominance class	Crown length	Crown width	Crown density	Tree class symbol	Estimated vigor-resistance index
1	Overmature	Dominant	Medium	Wide	Thin	O-MDCm	3
2	Mature	Dominant	Medium	Medium	Dense	MDCm	6
3	Young	Dominant	Long	Medium	Dense	YDCl	10
4	Overmature	Dominant	Long	Medium	Medium	O-MDCl	4
5	Mature	Dominant	Long	Medium	Dense	MDCl	7
6	Young	Dominant	Long	Medium	Dense	YDCl	10
7	Mature	Dominant	Long	Medium	Medium	MDCl	7
8	Young	Intermediate	Medium	Medium	Dense	YICm	8
9	Young	Overtopped	Long	Wide	Medium	YOCl	7
10	Young	Dominant	Long	Wide	Dense	YDCl	10
11	Young	Intermediate	Medium	Narrow	Dense	YICm	9
12	Young	Overtopped	Short	Wide	Thin	YOCs	5
13	Young	Dominant	Long	Medium	Dense	YDCl	10
14	Mature	Dominant	Medium	Medium	Medium	MDCm	6
15	Mature	Intermediate	Short	Wide	Medium	MICs	4
16	Overmature	Dominant	Long	Wide	Medium	O-MDCl	4
17	Young	Intermediate	Medium	Medium	Dense	YICm	8
18	Young	Overtopped	Short	Wide	Medium	YOCs	6
19	Young	Dominant	Long	Wide	Dense	YDCl	10
20	Mature	Dominant	Long	Medium	Dense	MDCl	8
21	Young	Dominant	Long	Narrow	Dense	YDCl	9
22	Young	Dominant	Long	Medium	Dense	YDCl	10
23	Overmature	Dominant	Long	Wide	Medium	O-MDCl	4
24	Mature	Dominant	Long	Wide	Thin	MDCl	5

Three Grades of Cuttings

On the concept that conversion to predominantly spruce stands and maintenance of vigorous stock promote stand resistance to budworm damage, three grades of resistance cuttings were evolved. They were designed to meet varying stand conditions and management objectives. Basically these cutting methods are forms of selection cutting. For convenience they have been designated Grade A, Grade B, and Grade C.

Grade A cutting.—This grade of cutting is farthest from ideal selec-

tion cutting. Attainment of a high level of resistance is the primary consideration. This must frequently be accomplished at a sacrifice of growing stock and with consequent slow wood production and danger of windthrow.

Under this grade of cutting practically all balsam firs above 5 inches d.b.h. are cut. This leaves no merchantable-sized balsam fir as growing stock. All healthy spruce below 14 inches d.b.h. are reserved. The reserve stand will consist then of spruce with admixtures of hardwoods and other conifers.

Grade B cutting.—In this grade of cutting attainment of stand resistance and satisfactory growing stock are given equal importance. A smaller proportion of the class of trees subject to damage is removed. This presumably leaves a less resistant stand than Grade A cutting but a greater volume of growing stock, hence better opportunities for rapid wood production.

Grade B resistance cuttings reserve the bulk of the 6- and 7-inch balsam fir as well as spruce below 14 inches d.b.h. However, those spruce and fir that would fail to qualify as desirable growing stock under normal intensive forestry practice because of disease, low vigor, etc., are cut. The reserve stand then often contains 2 or more cords of merchantable-sized balsam fir per acre in addition to spruce growing stock in the 6- to 13-inch diameter classes.

Grade C cutting.—This grade of cutting is practically the equivalent of ideal selection. Retention of a desirable volume of growing stock outweighs the attainment of maximum resistance. A greater volume of growing stock is retained than under either Grade A or Grade B cutting but this must often be achieved through the retention of balsam fir in the large diameter classes, thus leaving a more susceptible and vulnerable stand.

Grade C cuttings reserve a high proportion of the 6- and 7-inch balsam fir together with good risk specimens in the 8- and 9-inch classes. All healthy spruce below 14 inches d.b.h. are reserved, along with occasional trees above that diameter. However, individuals of both spruce and balsam fir that are considered silviculturally undesirable are cut. Under this scheme of cutting the reserve stand may consist of 3 or more cords of balsam fir per acre in addition to considerable spruce volume in the 6- to 13-inch and larger diameter classes.

Application to Different Stand Conditions

In most instances the application of the three grades of cutting will provide variation in residual volumes, and for certainty, variations in stand structure.

This is clearly brought out in Table 10. Here are shown the theoretical volumes of residual growing stock retained under each of the three cutting methods. Highest volume is retained under Grade C cutting—8.0 cords per acre. Grade B cutting is second with 6.1 cords. Grade A cutting is third with only 4.1 cords. Volumes removed are 4.0, 5.9, and 7.9 cords per acre respectively; equal to approximately one-third, one-half, and two-thirds of the original volume.

Mature and overmature stands.—Which grade of resistance cutting to apply will depend upon the budworm hazard and silvicultural considerations. In zones and stands subject to extremely heavy attack only the most resistant tree classes should be held. Some stands, in fact, have reached a stage where resistance cuttings are impractical and of little avail. Two such types of stands are commonly encountered: (1) stands with a high content of mature and overmature balsam fir, and (2) overmature, even-aged spruce stands.

Such stands have passed their period of optimum growth. They are subject to windthrow or wind breakage as well as serious attack from forest pests such as butt rots and eastern spruce bark beetle. Practically the only recourse in such stands is to cut all merchantable trees with the main thought in

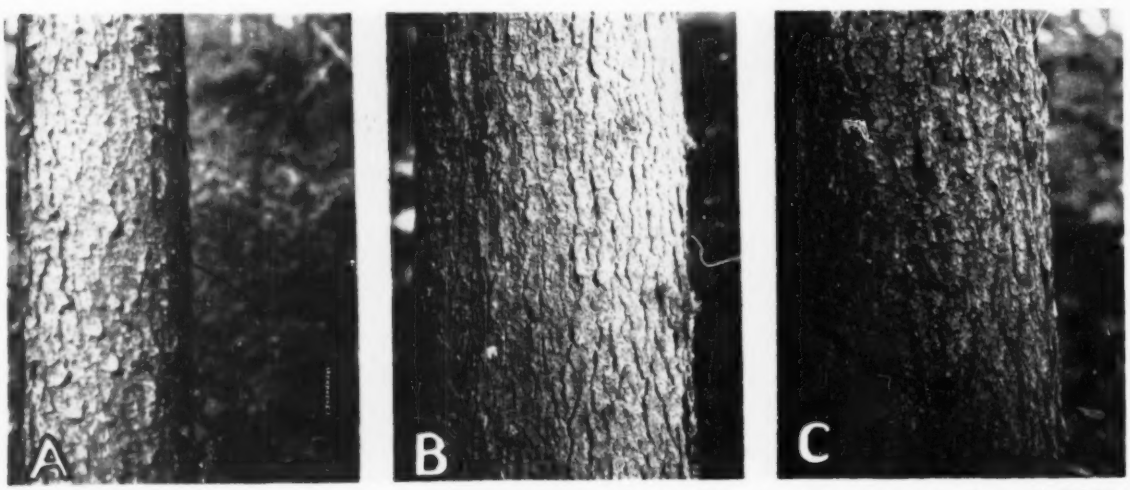

FIG. 7.—Bark characteristics of spruce are useful in classifying trees by age class. *A*, young spruce; note the small disk-like scales. *B*, mature spruce; the thin scales are elongated. *C*, overmature spruce; the bark is ridged and thick.

mind of reducing the intensity of the outbreak and damage.

Though such cuttings effect a decrease in budworm losses, they admittedly do little toward reducing stand susceptibility; for as pointed out elsewhere, clear-cutting creates favorable conditions for dominantly balsam fir regeneration. Thus efforts to increase resistance must await a stage in the development of the incoming stand where cultural measures aimed at promoting resistance become feasible.

All-aged and young even-aged stands.—Such stands are well adapted to budworm-resistance-cutting methods. Included in this group are young, merchantable, even- or uneven-aged stands of spruce and balsam fir in varying mixtures, other conifers in mixture, and hardwood admixtures in varying amounts.

Stands with high spruce content.—where stands have a high spruce content most of the poorer-risk balsam fir (those with ratings below 8) and poor-risk spruce (those with ratings below 5) should be cut. Normally this can be accomplished by cutting spruce 14 inches d.b.h. and larger plus those of poor risk below this diameter as well as all balsam fir above 5 inches—the equivalent of Grade A cutting.

Where balsam fir saplings and poles approach those of spruce in number, a Grade B cutting is recommended, in which a high proportion of the thrifty 6- and 7-inch balsam fir are reserved. Left as growing stock will be the spruce segment of the stand below 14 inches along with considerable numbers of high-vigor balsam fir.

Stands with high balsam fir content.—Where stands have a low spruce and high balsam fir content the problem is more difficult, for potential budworm-resistant growing stock is likely to be scarce. Application of high-level resistance cuttings to such stands would leave them subject to windthrow. Faced with such a condition, the forester is forced to compromise and lower his resistance standards.

In such stands all vigorous good-risk spruce should be retained regardless of size. Dependence for residual growing stock rests on such trees plus considerable numbers of the most vigorous 6-, 7-, 8-, and 9-inch balsam fir (in the 5 to 7 resistance range). In other words, Grade C cuttings appear most suitable under these stand conditions. To remove all merchantable-sized balsam fir would leave the stand subject to windthrow and incapable of rapid wood production.

TABLE 10.—COMPARISON OF VOLUMES RETAINED AND REMOVED PER ACRE UNDER THREE GRADES OF RESISTANCE CUTTINGS
(50-year-old cuttings in a dominant softwood type)

Diameter classes	Grade of cutting A		B		C	
	Retained	Removed	Retained	Removed	Retained	Removed
Inches	*Cords*	*Cords*	*Cords*	*Cords*	*Cords*	*Cords*
Balsam fir:						
6-7	0	2.3	2.0	0.3	2.0	0.3
8-9	0	1.7	0	1.7	1.3	.4
9+	0	1.1	0	1.1	0	1.1
Spruce:						
13 or less	4.1	1.0	4.1	1.0	4.1	1.0
13+	0	1.8	0	1.8	.6	1.2
Total	4.1	7.9	6.1	5.9	8.0	4.0

Use of Tree Classification System

In undertaking the types of cuttings described above, the marker must decide which trees should be cut and which should be left. The tree-classification system was designed to aid the marker in making these decisions.

On areas that call for light removals, such as in Grade C cuttings, the marking problem is rather simple: the number of obviously weak, low-vigor trees on the area approaches or exceeds the number of trees that should be removed. The important thing here for the marker is to concentrate on selecting trees that should be removed from the stand rather than those that should be retained. It

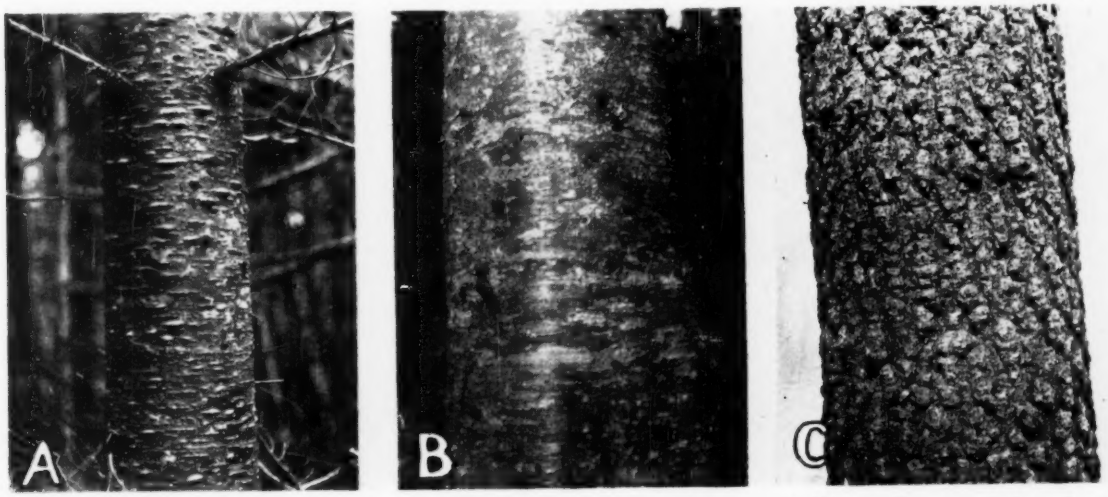

FIG. 8.—Bark characteristics of balsam fir trees. *A*, young balsam fir has numerous resin blisters. *B*, mature balsam fir; this has thicker bark, fewer resin blisters. *C*, overmature balsam fir, showing rough, thick bark.

goes without saying that the poorest risk trees should be cut first. Such trees are easily recognized. Normally they comprise the low vigor-resistance group—trees with ratings of 0 to 4 (Table 8). Tree 1 and Tree 4 in Figure 2 are representative of this group; their bark characteristics are similar to those shown in Figures 7*C* and 8*C*.

On the other hand, where a relatively small volume is to be retained, as in grade A cuttings, it is important to concentrate on the trees that should be retained. Thus if two-thirds of the stand is to be removed, the trees to be retained should be the most vigorous one-third. Normally, these would consist of the tree classes listed in table 8 with vigor-resistance ratings of 8, 9, and 10. They are similar to Trees 3 and 6 in Figure 5 and Trees 8 10, and 11 in Figure 3; and their bark approaches the characteristics of those shown in Figure 7*A* and 8*A*.

Grade B cuttings present a more difficult marking problem. The marker must combine the approaches used in Grade A and Grade B cuttings; that is, to retain the highly vigorous trees (ratings 8-10) and to eliminate the low vigor trees (ratings 0-4). But to assure a growing stock comparable to that called for in a Grade B cutting, it is essential to retain a considerable number of trees in the medium vigor-resistance group (ratings 5-7). The amount of this additional volume needed determines the limits of tree classes above which they should be reserved and below which they should be cut.

This entails many hairline decisions. Often use of the tree-classification system will give equal ratings to groups of two or more trees under consideration. In such cases, additional factors that affect a tree's survival potential must be weighed to determine which are the superior trees. These factors include crown width and density (Fig. 5), number of dead twigs, color of needles, and length of terminals.

Over-All Considerations

In applying resistance cuttings to spruce-fir stands care must always be exercised to retain stems in sufficient density and volume (preferably spruce) to preclude windfall and assure rapid increment. Cutting should not remove more than 40 per cent of the volume; in no event should it exceed 60 percent.

These measures will make possible the short cutting cycles necessary to maintain thrift, assure reproduction, and achieve the favorable composition ratio considered essential to resistant stands. But bear in mind that stand resistance cannot be achieved overnight. It is a step-by-step process attained through repeated cuttings, each of which should further increase the resistance level of the stand.

In the development of the resistance-cutting methods sight should not be lost of the over-all objective of materially increasing the region's rate of wood production. Fortunately the methods of building up resistance to spruce-fir stands to budworm attack parallel closely the techniques required to attain the normal silvicultural objectives of increased growth.

With careful coordination, a management program of light but frequent cuttings can be established, directed toward removing old, decadent balsam fir as well as weakened slow-growing trees and retaining young and vigorous growing stock. Frequent cuts not only make for rapid conversion to resistant stands but help sustain high growth rates and reduce losses by utilizing trees likely to die within the next few years.

Of course conditions exist where this method cannot be applied in its entirety. Economic considerations will determine the extent of its adoption. But in weighing the various factors full consideration should be given the greatly increased yields attainable in the future under such a management program.

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A Forest Conservation-Taxation Experiment in New Hampshire

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The State of New Hampshire has upon its statute books a law which is called An Act Relating to Forest Conservation and Taxation. *This is an experiment to achieve conservation of a natural resource through a change in the method of taxation. This attempt must be called an experiment, or at least regarded as still confined to the experimental stages, because the law has been on the books only a short time, having taken effect on April 1, 1950. It would appear at this time that the general principle and the declared policy of the law are sound. Some changes have already been made in the administrative details, and it is possible that there will be other changes made by future legislative amendments as the need for them becomes apparent. The law, however, in its present form has done a great deal to relieve the problem of an annual tax on growing wood and timber which plagued the timberland owners of New Hampshire for so many years.*

UNDER the former system of an annual general property tax in New Hampshire it was unprofitable to hold growing wood and timber until it reached the point of its maximum utilization. The assessing officials of the towns and cities also realized that full compliance with the tax laws in the assessment of the annual tax on growing wood and timber at its full and true value could result in but one end—the destruction of the forests of the state through immediate clear cutting. As a result, while the timber owners felt the pinch of an annual tax on growing wood and timber, assessed on an average valuation of something less than fifteen percent of the full and true value, other types of property had to bear the burden of this disproportionality to support the needs of local governmental functions.

Many attempts were made to promote legislation which would correct this situation, but it was not until the first session of the legislature under Governor Sherman Adams' administration that the present law was passed. Mr. Adams had been connected with the timber industry prior to becoming governor, and was greatly interested in the problems of timber conservation which, he felt, was affected considerably by the method of taxation then in effect. He gave his personal direction to the job of writing a conservation measure which was enacted into law, and which with minor changes stands on the law books today.

Problems Involved

The writers of the bill, realizing that the problem of timber taxation was closely related to the problem of conserving timber, wrote the act with a declared policy which considered both subjects. Because this policy defines so clearly the purpose the writers had in mind, it is quoted below:

> It is the declared purpose of this act to encourage conservation of the forest resources of this state by releasing growing wood and timber from the yearly burden of local property taxes and substituting a yield tax, so as to give an incentive to the owners of standing timber to abandon destructive cutting practices in favor of long range forest management plans and to promote the restocking of depleted forest lands by conserving an understory of immature trees of desirable species. It is further designed to provide a continuous, sustained yield of wood and timber for New Hampshire wood-using industries and to stabilize employment in those industries, to maintain forest lands at their maximum productiveness, to protect the water resources of the state, to minimize the effect of droughts, and to maintain a more constant water level in wells, springs, streams and public water supplies. It is also the purpose of this act to benefit the agricultural, industrial and recreational interests of the state, and to provide healthful surroundings, scenic values and improved conditions for fish and game.

In drafting this act it was essential that this policy be kept in mind, together with the fact that New Hampshire was one of the states which had fought for years to keep free from as many state and federal controls as possible. The writers were hard pressed to develop an idea which would bring the desired results without resorting to regulatory forest practices. After much discussion among the many interested parties who were called in to lend their assistance, it was decided that if an abatement of certain portions of the yield tax was given for following good forest practices it would result in conservation without regulation. While the inhabitants of New Hampshire have never been too enthusiastic about receiving something for nothing, the idea that they could obtain some relief from taxation by adhering to some very simple rules in their cutting practices appeared acceptable.

Having arrived at a solution to this problem the writers of the bill were next faced with the fact that the exemption of growing wood and timber from the annual property tax would create a loss in tax revenue to the towns and cities. This was the barrier which in years past other proponents of this same type of legislation had been unable to surmount, and which had defeated all previous attempts to modify the forest taxation laws. Just how much revenue would be lost was the first fact which had to be determined. This information should have been readily available, because the 1943 session of the legislature had enacted a law requiring the assessing officials of the towns and cities to assess the value of, and tax, growing wood and timber separately from the land upon which it was growing. However, compliance with this requirement had not been completely satisfactory, consequently the information afforded the writers allowed them to determine only an approximate valuation for the amount of growing wood and timber in each city and town. Since this was the only data available it had to be used.

From these approximate figures a "base valuation" for each town and city was computed by taking an average of the timber valuations for the years 1944 through 1948. It was an arbitrary decision upon the part of the writers to use these years. They were influenced only by the fact that the bill as they wrote it was to be introduced early in the 1949 session of the legislature, sometime prior to the April first date of the annual property assessment, and they felt that since it was known that a change in timber taxation was contemplated the assessment of timber for 1949 might be materially affected. It was thought best to disregard any figures for that particular year.

Having arrived at a "base valuation" figure which could be used, it was then necessary to decide upon a tax rate which could be applied against it to compute the apparent loss in tax revenue. There were four rates which could be used: a rate based on an average local rate for each taxing district for the period 1944 through 1948; a rate based on the average rate for the state for that period; a rate based on the current average state rate as determined for each year the new law would be in effect; or the current average rate for each locality for each year the new law would be in effect. Since the current annual average tax rate for any taxing district is affected considerably by the amount of money appropriated each year for all municipal purposes, it was decided that the amount of tax loss for each current year must be the amount of loss to be determined. While of necessity the average valuation for the five-year period mentioned had to be used, it was decided that the use of the current average tax rate would show more realistically the actual loss in tax revenue. Thus by use of an average valuation and the current average tax rate it was only a matter of simple arithmetic to arrive at the amount each municipality would lose in tax revenue by the exemption of growing wood and timber from taxation.

However, the mere possession of the knowledge of how much revenue would be lost did not give the answer as to how to clear the barrier which had stymied other attempts to change the method of forest taxation. The question of how to provide money to reimburse the taxing districts for this loss in revenue had to be answered. With no other source of revenue than the local taxes upon which a town or city could depend for the necessary funds to support the operation of the municipal government, it could readily be seen that the loss in tax money caused by the enactment of a law which exempted a certain class of property from the general property tax could only result in increased taxes on those classes of property not exempted, a condition unacceptable to the citizens of the state.

Yield Tax Adopted

To provide some revenue to replace that lost by the provisions of the act it was contemplated that a yield tax should be imposed upon the stumpage value of the growing wood and timber at the time it was severed from the stump. This, like the general property tax, was to be assessed and collected locally, and under favorable conditions would replace—at least in part—the revenue which the municipalities had received from the annual general property tax on the growing wood and timber. The writers realized, however, that the amount of revenue derived from such a tax depends upon many unpredictable factors, the most important being the demand for lumber. They knew full well that the amount received in any one town or city from the yield tax might be decidedly less than the revenue received from the annual tax on growing wood and timber. How to make up the difference so no one taxing district would be a loser because of this new law was a matter of considerable importance.

State Replacement of Local Tax Loss

One fact in favor of the enactment of an act which would exempt growing wood and timber from an annual tax was undebatable. Every person recognized that conservation of the forest resources was of vital importance. Depletion of the forests would vitally affect the economic structure of the state. With this knowledge firmly established in their minds the writers finally agreed that the replacement of the loss of tax revenue should be made up at the level of state government. Precedents had been set by previous legislatures in solving other problems involving like sums of money by state appropriations. It was decided that the same approach should be made in this case. Each city or town should be reimbursed from a fund which the legislature could create for this express purpose. Having decided upon the source of the money, the next question was how much would be needed. This was a real puzzle. The actual amounts and value of the timber cut in previous years were unknown. The most reliable source of information was a record kept by the state forester of the amounts of raw materials produced in the state and used by the wood-using industries of the state. These reports, however, did not include amounts cut and removed from the state to be processed elsewhere. Consequently the amount and value decided upon was only an approximation, but it was the best information available. A simple mathematical calculation of subtracting the estimated yield tax on this valuation from the total of the losses which the towns and cities could be expected to sustain showed that approximately $150,000 a year would be needed to make up the loss of tax revenue to each city and town when a yield tax was substituted for the annual general property tax on growing wood and timber.

Having arrived at an apparent solution to the serious problems which had halted the passage of a conservation-taxation measure in the past, the writers were faced with the job of working out the details of administration. This was a comparatively easy task. Like all laws governing taxation, this measure when passed would

come under the supervision of the state tax commission. Since this was the case, it was decided to call upon the commission members for their ideas. Through their efforts the administrative details of the act were written with an idea of making it just as simple as possible for the local assessing officials to handle. In order to do this the state tax commission felt that it was necessary to provide these officials with a method which would alert them to the fact that woods operations were being conducted within the boundaries of their respective cities or towns. Consequently it was specifically written into the law that whenever an operator intended to cut growing wood or timber he must file a written notice of intent with the assessing officials prior to commencing such cutting. This notice is in no way to be construed as permission to cut, but is used only to provide the assessing officials with the information that an operation is to take place, where it is to be located, the estimated amount to be cut, and whether or not the operator intends to request an abatement for having followed good forest practices. It was also provided that legal action could be taken against an operator who failed to file such notice of intent to cut.

It was further provided that upon completion of an operation the operator must file a report of cut with the assessing officials. In this report the operator is required to state under the penalties of perjury the exact amount of wood and timber cut, together with enough other information to identify the operation in relation to the notice of intent filed for the same operation. The operator who requests the abatement for having followed good forest practices must file a certificate that he has complied with the standards established under the law. For simplicity it was decided to make this certificate a part of the report of cut form. Again, as in the case of the intent to cut, failure to file a report of cut makes the operator liable to legal action.

Minimum Cutting Standards

As has been stated, one of the problems the authors of the Act encountered was how taxation and conservation could be united under a common legislative act. As was also stated, this was done by means of an abatement of a portion of the tax given to an operator who complied with all the requirements of the law and operated under some very simple forest practice standards. It was decided that the yield tax which was to be levied should be at the rate of 10 percent of the stumpage value of the tree at the time of severance. However, certain forest practice standards were set up with the advice of professional foresters and lumber operators which, if complied with to the satisfaction of the assessing officials, qualified the operator for a 30 percent abatement of the assessed tax. The objectives which were desired in the establishment of minimum cutting standards as a basis for this 30 percent tax abatement were four in number, namely:

1. The establishment by natural regeneration or the planting of a new crop of trees of desirable species well distributed over the area to be operated where such young trees do not already exist in sufficient number, size or distribution to assure future soil protection and a future timber crop.
2. The preservation of sufficient existing young trees during logging so that the area cut over will produce a new crop of merchantable timber.
3. The improvement in composition, quality and spacing of young and merchantable stands so that growth and yields of forest products will be increased.
4. Improved forest protection by:
   (a) Reduced fire hazard through shading of soil, and less concentration of slash.
   (b) Reduced fire risk through education for woods workers.
   (c) Cooperation wtih public agencies in control of fire, insects and disease.

In order to fulfill these objectives there were certain forest practice standards which, separately or in combination, would be considered as meeting the requirements for the abatement if they were applicable to the area where the cutting took place. These were quite simple standards designed to be as practical as possible so that it would not be necessary to employ the services of technical personnel in order to conduct an operation which would satisfy the minimum requirements.

Under these forest practice standards, the completed job may qualify for the abatement if the method of operation decided upon is that of partial cutting which consists of cutting merchantable and defective trees by groups, strips, or individual trees so as to leave at least one-third of the merchantable volume in healthy trees of desirable species well distributed over the area cut, in order to establish a new timber crop. An alternate approved method of operation is that of harvest cutting where all the merchantable trees may be harvested provided sufficient young trees of desirable species at least three feet in height are present prior to cutting, and are protected in logging so that an adequate number of desirable young trees are left well distributed over the area after cutting and removal of all merchantable products. If neither of these two methods nor a combination of them is the method best suited for the area, but the operator desires to follow any other good forestry practice consistent with the objectives previously outlined, the operator may make written application to the state forester, describing in detail the practices he desires to follow for this special case. If this plan is approved, it shall be considered as the standard cutting practice for the area to be operated.

Enactment

In its final draft the bill was enacted into law by the 1949 session of the legislature. It took effect on April 1, 1950. Beginning on that date growing wood and timber was exempted from the annual general property tax. Based on the facts and figures available, the state on that date assumed the obligation to pay to the towns and cities the sum of $447,335 if there was no standing wood and timber cut during the period April 1, 1950 to April 1, 1951. Under the provisions of the law the date of assessment was set as October 1 of each

calendar year. This created in 1950 the unusual and not too desirable situation in which the state assumed the burden of a full year's loss in tax revenue while the period for which the yield taxes were to be assessed was but six months in length, namely April 1, 1950 to October 1, 1950. This was an unfortunate circumstance, yet there appeared no other way in which the law could take effect in 1950 without a loss of tax revenue to the municipalities.

Results of First Year

While considerable educational work was done before and after the enactment date through a series of meetings with assessing officials and other interested parties, and through assistance rendered in many individual cases by persons employed by the state, the change in the method of taxation was so radical that it was impossible during this first tax period to obtain full compliance with all provisions of the law. It was particularly difficult to acquaint the assessing officials with the method of arriving at a fair and equitable stumpage value for assessment purposes. Although a definition of "stumpage value" was written into the law and the assessing officials were given specific items which they were to consider in arriving at this value, the method of its determination was not given in clear cut and decisive language. It appeared that anyone connected with woods operations knew what "stumpage price" meant when it was mentioned before the enactment of the law; but with the advent of the phrase "stumpage value" as used in this law some confusion resulted. It was particularly difficult for many assessing officials and operators to differentiate between the two. It was generally believed that the price paid per unit by an operator when he purchased standing wood and timber was also the stumpage value upon which the yield tax was to be levied. This is not necessarily so. There are cases where they may be the same, but generally the price paid for stumpage will be lower than the actual stumpage value of the tree at the time of severance. The reason upon which this assumption is based can be explained in this manner: An operator desiring to purchase a certain amount of stumpage will in most cases make a physical inspection of the lot where the stumpage is located. He will figure his costs of operation and the amount of profit which he feels he should make. Knowing the sale price he can obtain for his logs he will subtract the costs of operation and profit from this price and will arrive at the highest amount he can pay per unit for that particular standing wood and timber. Rarely will he offer to pay this price per unit to the owner, but will offer a somewhat lesser price, hoping to purchase it for the amount offered, knowing full well that he can pay as much as the figure he arrived at in his calculations and still make his anticipated profit. This is good business. If he is able to purchase the stumpage for an amount less than the per unit value he has calculated he has established a stumpage price which is less than the actual per unit value of the standing wood and timber. Thus there is a difference between stumpage price and stumpage value. Stumpage value is the greatest amount which an operator can pay per unit and still make a profit on the operation. Stumpage price and stumpage value are synonymous only when an operator has to pay a per unit price which is all he has calculated that he can pay and make a profit.

Because of this misunderstanding many assessing officials used the stumpage prices given them by the operators as the true stumpage values for assessment purposes during the first taxing period the law was in effect. Consequently, payments to the cities and towns from the reimbursement fund of $300,000 set up by the legislature were considerably higher at the end of the first year than had been anticipated. The total revenue from the yield taxes assessed in the first tax year, April 1, 1950 to September 30, 1950, was only $100,307. It was necessary for the state to make up losses from the reimbursement fund in the amount of $352,344. It was clear from the results of this one year that an educational program of a wider scope than any previously conducted must be launched, or a reimbursement fund of $300,000 would not be sufficient in any biennium.

Results of Second Year

The results of the second tax year, October 1, 1950 to September 30, 1951 were somewhat different. The state tax commission had requested the 1951 session of the legislature to make some administrative changes in the law, the principal one being a provision which required that an operator file a copy of his notice of intent to cut and report of cut directly with the commission office. As the basic law was written each city and town is required to apply to the commission for any reimbursement due for loss of tax revenue. The actual amount of this reimbursement has to be determined by the commission, which in turn makes a certification to the state treasurer for payment of the same. Under these circumstances the commission felt that it did not have sufficient information to allow it to keep an accurate check on the number of operations and the amounts reported as cut. This could only be accomplished by having copies of all the forms sent to the commission office to be kept on record. In addition, to assure that the certification of the amount of reimbursement made by the commission to the state treasurer was correct the law was amended to require that the assessing officials be required also to certify the amount of yield taxes assessed to the tax commission. Since the legal action referred to in the original law in regard to failure to file with the assessing officials the required forms for intent to cut and report of cut could only be taken in the superior court, it was difficult to get the assessing officials to take this action. The law was amended to allow action to be taken in a municipal court by either the assessing officials or the tax commis-

sion, thus making it easier to enforce the law. In order to promote a broader educational program and to provide additional assistance to the assessing officials, the tax commission requested and obtained sufficient funds to employ two field men who aided the assessing officials in the administration of the law.

These amendments proved most valuable during the second year the law was in effect. The yield tax assessed for this second tax year totalled $358,942. The loss due to the exemption of growing wood and timber from an annual tax was $463,773. Had this tax been assessed and collected entirely on the state level with the reimbursement fund a true revolving fund, the surplus which any city or town might have had of assessed yield taxes over tax loss would have been paid into that fund. If such had been the case there would have been a net deficit of $104,831. But this is a local tax assessed and collected locally, and paid into the local treasury just as is any other local tax. There was, however, a provision written into the law which would recover some of the reimbursements to the cities and towns if and when the assessed yield taxes in such city or town exceed the loss of tax revenue. It was provided that whenever a town or city received a payment from the reimbursement fund for loss in tax revenue, the amount of such payment was to be carried as a credit to the state. When a city or town has an excess of yield taxes over loss of tax revenue such excess, up to the amount of credit held by the state against that city or town, is returned to the reimbursement fund. Therefore, as previously stated, where there should have been a net deficit of but $104,831 there was actually due to towns and cities a sum equal to $201,234 to make up for losses in tax revenue. However, there were at the end of this taxing period a total of thirty-nine towns and cities which were able to make partial refunds to the state for amounts "borrowed" in 1950. This meant that while their assessed yield taxes exceeded their losses in tax revenue they did not receive enough to make full payments for losses reimbursed in 1950. There were forty towns which were more fortunate and were able to make full payment of the amount "borrowed" in 1950. Consequently the net deficit was $201,234 less repayments of $31,802, or $169,432.

While only twenty-two towns and cities in the 1950 tax year had a total of $7,181 excess of yield taxes over tax revenue, at the end of the 1951 tax year 107 towns and cities were in the same position with total excess of $96,403. Of these 107 towns and cities, 67 had an excess of $71,782 to apply against future tax losses. Considering all the factors involved, the general trend in the second year was toward much better administration of the law on the local level.

Results of Third Year

On September 30, 1952 the third tax year came to an end. For the first time comparative figures were available for two complete tax periods. An increase in the current average tax rates of the cities and towns caused the total tax loss due to the exemption of growing wood and timber from the annual tax to increase to $474,190. While the actual amount of wood and timber cut decreased by approximately fifty million feet, it was evident that the assessing officials arrived at stumpage values which were more nearly correct than in the past, because there was a total of $379,154 of yield taxes assessed. The reimbursement due to the towns and cities increased slightly, to $202,181, and the repayments to the state decreased to $25,120, making a net payment of $177,051 to the cities and towns from the reimbursement fund for loss of tax revenue.

At the end of this third tax year the results showed that there were 109 towns and cities with an excess of yield taxes over tax loss equal to $109,696, and of these towns and cities 80 had a total of $70,173 to apply against future tax loss, which compared favorably with the 1951 tax year.

Forest Practices Under the Act

So far we have concerned ourselves primarily with the portion of the law relating to taxes. What has been the result of this law in terms of conservation? The records kept during the first tax period (1950) were inadequate, consequently the number of operators who requested the abatements for having followed good forest practices and those found eligible for the same is not known. In 1951 a total of 455,701,710 board feet was cut on 4,357 operations. Of these operations, 1,204 requested the abatement, and 854 were granted it. Of the total cut, 122,477,805 board feet, or 26.87 percent, was subject to the abatement. In the 1952 tax year a total of 403,283,713 board feet was cut, of which 141,583,352 board feet, or 35.13 percent, was eligible for the abatement. This amount was cut on 4,123 operations, of which 1,518 requested the abatement and 959 were allowed it. Just how indicative these figures are of the increase in forest conservation because of the passage of the yield tax law, is not known. Quite possibly there are some operators who through lack of a complete knowledge of the law do not apply for the abatement even though their operations would qualify if they did so. Some of the inspection reports received by the tax commission from its field agents indicate this. When such cases are found the commission informs the operators that had they complied with the provisions of the law in regard to making a request for the abatement they would have qualified. Attention is also called to the fact that if they operate in a like manner in the future their operations may qualify provided they request the abatement. An administrative change was made in the law during the 1953 session of the legislature making it necessary for operators to request the abatement only upon the report of cut, and not requiring them to indicate on the notice of intent that they intend to do so. There has also been some indication that the differential was not great enough

between the 30 percent abatement for cutting under good forest practices to make it worth while for the "cut out and get out" type of operator to change his method of operation. The question of an increase in the tax from 10 percent to 15 percent of the stumpage value, with a consequent increase in the amount allowed for the abatement of the basic tax was proposed in the last legislative session but was not adopted, although there were many who favored such a move.

Amendments to Act

Among the administrative changes adopted by the 1953 legislature was an amendment which strengthened the chances of a city or town in obtaining the bond or other security which the original law allowed them to request from an operator before or during an operation to insure payment of the yield tax. It was found that in some cases the assessing officials were refused when they requested such bond or security. Since their only recourse in case of such refusal was action to stop the operation, brought in the superior court, these officials were reluctant to spend the amount necessary to bring such action, especially when the amount of the tax was less than they would have to expend to bring such action. The amended law allows the tax commission to step in in such situations and through the state attorney general's department bring the action at no expense to the city or town involved.

Another amendment passed which should assist in the administration of the law requires an operator to file a report of cut at the end of each tax year, even though his operation is still in progress at that time. Such a report shall include all timber cut, either from the beginning of an operation or from October first of the preceding calendar year, whichever the case may be. He must also file a supplemental intent to cut for the amount he intends to cut in the next tax year if his operation is still in progress after October first. This change was effected so the assessing officers might have a date when they could start the new tax year with new records covering the operations conducted during the next tax period.

Still another administrative change was made in the adoption of an amendment regarding the requirement that all towns and cities certify the amount of yield taxes assessed by them for the tax year. Heretofore the tax commission had little control over the actual stumpage values upon which the yield tax assessments were based. Their field agents could only recommend what they believed were fair and equitable values for operations they inspected. It was hoped the assessing officials would accept these recommended stumpage values and adopt them for their assessment purposes. If they did not there was little that could be done. If stumpage values upon which assessments were made were low, the reimbursement fund suffered to that extent. Since it appeared to be the legislative intent that the tax commission should have administrative control over this fund, it was felt that they should also have some control over the local assessments as they were made. To provide this control it is now necessary that all yield tax assessments be approved by the tax commission, and no assessment shall be final or binding until it has such approval. The amount of reimbursement to which any city or town is entitled is based on the assessment finally approved by the tax commission.

Since the law is an experiment in a new method of attaining conservation through a change in the manner of taxation of timber, it has attracted nation-wide attention. The reactions of the citizens of New Hampshire and of the neighboring states who are concerned most vitally with this law have been many and varied. There has been a definite gain in the number of local assessing officials and timber operators who have come to favor the law during the period it has been on the statute books. Most of the operators who own their own timberlands and have permanent woodworking installations have favored it from the start. They have a definite stake in the future of the forest resources of New Hampshire. The "cut out and get out" type of operator has opposed it, and while this type of operation is becoming a thing of the past, those who remain still oppose it—probably because they must now pay a tax where before they weren't required to do so.

While there was talk in the 1953 session of the legislature of a direct attempt to repeal the law, with the intention of going back to the old method of forest taxation, such a move did not materialize. There were some persons who felt that the results of two and one-half years of this method of taxation did not produce enough conservation to warrant the expense to the state. The proponents of this theory were able to accomplish passage of a measure which set up an interim study group to make a thorough investigation of the law's accomplishments, and to report back to the 1955 legislature its findings with any recommendations it might have as to how the cost to the state might be reduced.

Conclusion

It is believed that for the most part the citizens of New Hampshire who, like those of other states, have growing wood and timber as their great natural resource, are vitally interested in its conservation to the end that the supply will never be completely exhausted. It is hardly possible that a change in policy can be found which is better than that laid down in the present basic law. It is felt that while accomplishing conservation through a change in the method of taxation may be considered by many as an odd combination, basically it is a step in the right direction. It is quite possible that New Hampshire's forest conservation-taxation experiment may become a valuable forest conservation-taxation experience—one which will cause other states to adopt its basic principles in the near future.

A Preliminary Report on Intensive Beaver Management[1]

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Most present-day beaver management is extensive management. It consists of state-wide or county-wide restriction of seasonal take, trapping seasons, and trapping technique. Such measures maintain the beaver population of a region by limiting the harvest to insure a residual breeding stock in the region.

The present high beaver populations of many areas are the direct result of the extensive clear cutting of timber and the widespread forest fires which were characteristic in the northern forests until recent years. Modern forest fire control and intensive forest management practices are gradually reducing the areas of suitable beaver habitat. The beaver is adapted to the early stages of forest succession, especially the post-fire types which include aspen and willow. It is reasonable to predict that beaver populations in managed forests will be sharply reduced when the forest is maintained in a constant cover of climax tree species.

Extensive beaver management does not consider the ecological relation of beavers to their environment. It merely limits the harvest by restrictive control of the activities of beaver trappers. Under such a system of management some beaver colonies are trapped out and much beaver food may be wasted before the site is reoccupied. Other beaver colonies in the same region may remain untrapped and surplus beavers may migrate to areas where they are a nuisance problem. The current concern with the problems of flooding of valuable timber, invasion of trout streams and damage to crops and orchards is an indication that extensive management is not a completely satisfactory beaver management method.

Intensive beaver management, by contrast, requires a thorough knowledge of the ecology of forest succession and of beaver population dynamics. Under intensive management, high beaver productivity is sustained by the maintenance of early stages of forest succession. All surplus beavers are harvested, thus maintaining a balance between the residual population and its food supply. The harvest of all surplus animals also prevents them from stocking other areas where they may be unwanted. In other words, intensive beaver management strives to increase the beaver population by improving site conditions, thereby increasing the number of harvestable surplus animals at each colony site.

Before intensive beaver management can be undertaken, it is necessary to inventory the areas available for such management. The land must first be classified to determine which resource can best be produced on a given site. Under some conditions beavers are not compatible with other forms of land use. Some sites are best used in the production of timber or agricultural crops, while others may best be used for trout production. In still other areas, beavers are the preferred crop. It is for the land manager to decide at which sites beavers can best be produced.

The possibilities of intensive beaver management are being investigated on the 15,000-acre Huntington Wildlife Forest, a property of the State University of New York, College of Forestry (King, R. T. *et al*, 1941). The forest is typical of Adirondack Mountain areas to which intensive beaver management may be applied. This area includes 32 beaver colony sites, 27 of which are believed to be best adapted to beaver production. The five remaining sites are best adapted to spruce pulp production.

Site Management

Before intensive beaver management measures could be formulated, it was necessary to inventory the 27 colony sites to determine the beaver conditions at each site. The first step in this inventory was to determine the ecological status of the beaver food supply. It was found that the colony sites could be grouped into four "site types" on the basis of similarity of ecological conditions: Northern-hardwood, bracken, marsh, and hardwood-conifer. Each of these site types represents a different problem in the maintenance of a sustained yield of beavers.

The northern-hardwood colony sites contain abundant beaver food trees, but the trees are too large for the beavers to efficiently utilize. In addition, the more tolerant beech, birch, and maple are crowding out the old and over-mature aspen. Optimum conditions are being replaced or succeeded by conditions unfavorable to beavers.

In contrast, colony sites in the bracken site type present an entirely different food problem. Bracken sites were intensively burned over around 1900. Aspen and high beaver populations followed the fire. The beavers have now logged off the available aspen, and bracken fern has become dominant at the sites. The fern is preventing regeneration of more aspen trees, and most of the bracken sites have now been abandoned. The beaver manager must restore the food supply at these sites if beavers are ever to return.

Colony sites in the marsh site type are the most dependable beaver producers on the forest. The marshes contain an abundance of alder, willow, and red-osier dogwood. However, due to the flat terrain of marshes, beaver impoundments "drown" the available food supply. After short periods of abandonment, the foods regenerate and beavers reoccupy the marsh sites.

Hardwood-conifer sites complete the site type categories. At these sites spruce, balsam, and cedar are crowding out the beaver foods.

[1]Paper delivered at the 18th North American Wildlife Conference, Washington, D. C., March, 1953.

Also, beavers are reluctant to pass through the fringes of conifers to obtain the hardwoods which may lie beyond them. Thus, the problem at hardwood-conifer sites is mainly one of availability.

These are the general problems which face the beaver manager of a typical Adirondack forest. Similar problems are characteristic of forested areas in other regions. The ecological conditions which prevail at each site type suggest possible improvement measures which might be employed. These possibilities are also being investigated on the Huntington Wildlife Forest.

Bracken and marsh sites generally require some form of beaver food establishment. In these cases, the beaver manager must hasten natural succession, and establish foods which best meet the needs of each colony. For example, foods for marsh sites must be resistant to flooding. On the other hand, foods for bracken sites must be resistant to dry conditions. All beaver foods should sprout vigorously after they have been cut.

Food establishment measures may take the form of seed bed preparation, sprout encouragement, seedling planting, or the planting of cuttings. Seed bed preparation and sprout encouragement involve such techniques as burning, scarifying, disking, use of weedkillers, etc. Thus far, these techniques have shown little promise on the forest. While good food establishment results have been produced by planting seedlings, the procedure is slow and expensive. The most promising method found thus far for food tree establishment is the planting of cuttings. The method is unusually fast and economical, and involves planting cuttings of willow, striped maple, and dogwood in the soil adjacent to beaver flows.

Forest succession has already replaced optimum beaver conditions at hardwood-conifer and northern-hardwood sites. Therefore, succession must be "set back" in these areas. Several clearings have been created on the Huntington Forest, and some of these clearings now contain excellent stands of aspen a favorite beaver food. Thus, forest clearings represent an environmental improvement measure which may be employed at northern-hard wood and hardwood-conifer sites.

Population Management

Colony site improvement is but one phase of intensive beaver management. In addition, the beaver population at each site must be managed to remove surplus animals and maintain a balance between the beavers and their food supply. The beaver population of each colony site on the forest was determined with a fair degree of accuracy by live-trapping, food storage surveys, and observations of beaver activities. These censuses indicated that there are several types of beaver colony composition at the 16 active colony sites. Some sites support only one or two beavers, either adults or yearlings, which may not reproduce for several years. A few colony sites contain two adults and three or four kits, suggesting either a recently established population or one in which reproduction has been interrupted. The remainder of the active colony sites support a full population consisting of two adults, three or four yearlings, and three or four kits. At these colonies the yearlings leave the site just before the birth of the next year's young. These yearlings are surplus animals, which represent the profit from intensive beaver management. Their capture prevents the stocking of other areas where they may be unwanted, and yet does not interfere with the parent colony's production.

The problem of selectively trapping surplus yearling beavers is also being investigated on the forest. The harvest of adult animals stops colony production for several years. The harvest of kits is a wasteful procedure, since the animals' pelts will nearly double in value in just one more year. Therefore, it is essential that only the surplus yearling animals be taken. Thus far, live-trapping has been used exclusively for selective harvest on the forest. This method of harvest is both time-consuming and expensive, but further study may reveal more efficient selective harvest methods.

Summary

Present-day beaver management is extensive management. It consists largely of restrictive control of beaver harvest, thus maintaining a regional breeding stock. Extensive management will not continue to maintain satisfactory beaver populations in forest areas because of the development of selective logging methods and improved forest fire control. The beaver is adapted to early stages of forest succession and will be eliminated from many areas when the forest is maintained in climax vegetation.

In intensive beaver management suitable stages of forest succession are maintained at individual colony sites. Several site types are recognized, and the colony sites in each of these categories require a different form of management. At bracken and marsh sites some form of beaver food establishment is necessary to hasten the progress of succession toward favorable beaver habitat. At northern-hardwood and hardwood-conifer sites suitable beaver habitat has been replaced by climax vegetation, and forest succession must be set back. These various colony site improvement measures result in high beaver populations, and it is necessary to harvest all surplus animals from improved sites to maintain a balance between the beavers and their food supply. This harvest, in addition to providing saleable pelts, prevents emigration into areas where farm crops, timber, or trout are the preferred form of land use.

Intensive beaver management is still in the experimental stage and additional research and experience are required to make it effective.

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Effect of Pruning on Western Red Rot in Young Ponderosa Pine in the Southwest

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In 1947 an expanded program of timber stand improvement was begun in young ponderosa pine (*Pinus ponderosa* var. *scopulorum* Engelm.) stands of Arizona and New Mexico. This led to speculation regarding the degree to which diseases might offset the beneficial effects of pruning. In order to obtain an immediate appraisal of this question, a preliminary study was made in a number of immature stands that had been pruned between 1933 and 1940. Later, in 1949, additional observations were made to verify some of the preliminary conclusions relating to the development of western red rot in pruned trees.

Preliminary Study

The preliminary study in 1947 was conducted on nine areas in the Coconino, Kaibab and Sitgreaves National Forests of Arizona. Observations were limited to 932 crop trees that had been pruned to a maximum height of 17 feet. All exposed knots (about 13,000) and unpruned dead branches (about 4,200) below that height were observed from the ground for obvious signs of disease. A 10-percent sample (a total of 97 trees), approximating the size distribution of all crop trees on an area but irrespective of disease indications seen from the ground, was felled and dissected, and the knots of 1,479 pruned and 444 unpruned branches were examined.

In the laboratory, cultures were made from specimens of diseased branches, knots, and trunks. Isolations were usually made from several points in each infection in order to determine the viability of the disease organisms at varying distances from the outside of the tree.

Exposed knots as entrance points for decay and other diseases.—Results of the preliminary study indicated that exposed knots are unimportant as entrance points for decay or other diseases. No decay fungi were found that seemed to have established themselves in knots after pruning. The cut surfaces of dead branches normally are too dry for decay to develop. Although the cut surfaces of green branches may be moist, they are rapidly covered by a thick film of resin, which protects them until the knots are overgrown by callus tissue.

Atropellis piniphila (Weir) Lohman & Cash, was the only fungus observed that may be capable of establishing itself on the surface or along the edges of exposed knots. Fortunately, this organism, which causes cankers and dieback, appears to be abundant only in a few small areas in the Lincoln National Forest of New Mexico where it has been reported causing damage to seedlings and saplings.[3, 4] Observations in this forest in conjunction with the preliminary study indicated that the fungus had infected the trunks of pole-sized crop trees through unpruned branches. A marked reduction in the width of annual rings, which occurred in some diseased trunks after pruning in 1933 or 1934, suggested that the removal of dead and green branches either stimulated existing infection or provided entrance points for direct invasion of the trunk. If *A. piniphila* should become generally prevalent in second-growth stands of the Southwest, it could impair the value of pruning in those stands unless feasible control methods were developed.

The only fungus that appeared to warrant serious consideration in future pruning operations was *Polyporus anceps* Pk., the cause of western red rot, a source of serious loss in mature timber of the region. Earlier studies[5, 6] of this fungus had indicated that pruning protected first logs from decay by eliminating the principal avenues of infection, namely, recently dead branches. This work had also indicated that the fungus rarely, if ever, attacks exposed wood and the 1947 observations confirmed the point. No infections were found where the western red rot fungus had become established in knots exposed by pruning. In contrast to other common branch decay fungi[7], *P. anceps* readily penetrates the tight knots (tight knot, portion of the branch embedded before the branch died, as compared with loose knot, the portion of the branch overgrown after the branch died) of unpruned branches and

[1]Lake S. Gill, senior pathologist, Division of Forest Pathology, Bureau of Plant Industry, Soils and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture, called the author's attention to this subject and aided in planning and completing the studies. Carl Hartley, principal pathologist, Division of Forest Pathology at Beltsville, Md., offered a number of valuable suggestions. Assistance was also given by the following former employees of the Division of Forest Pathology at Albuquerque, New Mexico: Bessie E. Etter, scientific aid; Robert E. Millenbaugh, biological aid; and Arthur L. White, field assistant. The cooperation of C. Otto Lindh, regional forester, and other members of the Forest Service of the Southwestern Region greatly facilitated the field work.

[2]Division of Forest Pathology, Bureau of Plant Industry, Soils and Agricultural Engineering, Agricultural Research Administration, in cooperation with the Forest Service, Southwestern Region.

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[7]*Polyporus abietinus* Fr., *Fomes tenuis* Karst., *Stereum pini* Fr., *Merulius ambiguus* Berk., and *Lenzites saepiaria* Fr.

may be well-established in the trunk before pruning is undertaken.

Recognition of disease in exposed knots and unpruned branches.- The preliminary survey demonstrated that the presence of disease cannot be determined from ground observations alone. A clean cross-sectional area is necessary to detect western red rot and the other branch decays in the exposed knots of pruned trees, and this can be prepared only in the case of lower branches with little or no callus covering the faces of the knots. In the case of unpruned trees, it is usually necessary to examine each dead branch for western red rot after breaking or pruning it close to the trunk, since *P. anceps* can decay branches without changing their external appearance or developing fruit bodies. This rot was observed from the ground in 0.02 percent of the exposed knots and in 0.02 percent of the unpruned branches, whereas it was present in 1.7 percent of the knots of pruned branches and in 2.5 percent of the unpruned branches on dissected trees. Most other branch decay fungi fruit abundantly on branches during moist weather and can be determined from the ground.

Although the other decay fungi were often as abundant as *P. anceps* in dead branches, they were never found in the trunk heartwood and rarely penetrated the tight knot. They are of interest because they destroy the wood of many dead branches, thereby eliminating them as entrance points for western red rot. On the other hand, a relatively high proportion of the western red rot infections had penetrated the tight knot: 73 percent of the infections that extended inside the saw cut of pruned branches, 100 percent of the infections in unpruned branches. An appreciable number of these rot columns had extended down the tight knot into the heartwood of the trunk: 34 percent of the columns in pruned branches, 20 percent in unpruned branches. The latter probably were infected more recently than the pruned branches, as suggested by the fact that, in the case of tight-knot infections only, the pruned branches had been dead much longer (26 years) than unpruned branches (12 years). Limitations of the data prevented a comparison of branches leading to heart rot.

Results of the isolation tests indicated that while *P. anceps* was able to survive pruning better than the other decay fungi, exposure of the knots probably arrested or resulted in the death of an appreciable proportion of the infections that entered the trunk but had not reached the heartwood. None of the other fungi were isolated from decay in the exposed knots of pruned branches, although they were alive in all infections tested from the knots of unpruned branches. In contrast to this, the condition of *P. anceps* in infections exposed by pruning depended on the location of the rot column: the fungus was isolated from 4 of the 15 tight-knot infections tested, and from all 7 of the trunk-heartwood rot columns. In isolations from unpruned branches *P. anceps* was grown from all 4 tight-knot infections tested; no isolations were made from decay columns in the trunk heartwood, as it was assumed that the fungus was alive in all cases. While these results furnished evidence of the beneficial effect of pruning they could not be considered conclusive, because they were not based on a comparison of pruned and unpruned trees in which there had been an equal opportunity for infection. Furthermore, pathological observations had not been made when the preliminary study areas were treated in 1933 or 1934, and it was impossible to estimate the development of western red rot in the period following pruning. The dissection of additional trees during the examination of a number of western red rot survey plots in 1949 afforded an opportunity for procuring information on decay development and making isolations from *P. anceps* infections in unpruned as well as pruned trees.

Dissection Studies on the Western Red Rot Survey Plots

When the western red rot survey plots were established in 1939,[6] all dead branches to a maximum height of 17 feet were pruned from standing trees and examined for western red rot. The trees were numbered, and the infected branches were recorded by basal diameter and position on the trunk. Twenty percent of the trees that had rot extending inside the pruning cut were felled and dissected in order to determine the distance rot columns had penetrated the knots and trunk heartwood. Some isolation tests were made to verify questionable cases of western red rot.

Dissections in 1949 were restricted to plots in stands which were between 40 and 70 years old at the time of the original survey. Trees were selected on each plot to give approximately the same number and size distribution as the sample procured in 1939. Adjacent to each plot, usually two unpruned trees of comparable age, size, and infection were also dissected, to provide some indication of decay development under natural conditions. The dissections, which were made on 14 plots in five national forests of Arizona and New Mexico, are summarized in Table 1.

TABLE 1.—SUMMARY OF TREE DISSECTIONS ON THE WESTERN RED ROT SURVEY PLOTS

Plot age in 1939—yrs. Class			No. of plots	Average infection after pruning—percent of trees[1]	Number of trees			
					Orig. survey in 1939		Dissected in 1949	
Mid-point	Limits	Ave.			Total pruned	Dissected	Pruned in 1939	Unpruned in 1939[2]
50	41-55	52	7[3]	16	581	17	16	14
60	56-70	60	7[4]	29	560	34	25	12

[1]Does not include trees in which infections were limited to prunable portions of branches.

[2]Selected from trees adjacent to but outside the plots.

[3]Distributed in national forests as follows: Kaibab—1, Santa Fe—1, and Sitgreaves—5.

[4]Distributed in national forests as follows: Carson—3, Cibola—1, Kaibab—2, and Santa Fe—1.

TABLE 2.—SUMMARY OF ISOLATIONS ATTEMPTED IN CONJUNCTION WITH DISSECTIONS ON THE WESTERN RED ROT SURVEY PLOTS IN 1949

Rot column extending into:	Age class: 50- (41-55) year — Pruned in 1939 — Total No.	Pruned in 1939 — Positive pct.	Unpruned in 1939 — Total No.	Unpruned in 1939 — Positive pct.	60- (56-70) year — Pruned in 1939 — Total No.	Pruned in 1939 — Positive pct.	Unpruned in 1939 — Total No.	Unpruned in 1939 — Positive pct.	Both age classes — Pruned in 1939 — Total No.	Pruned in 1939 — Positive pct.	Unpruned in 1939 — Total No.	Unpruned in 1939 — Positive pct.
Loose knot only	6	0	6	50	3	0	5	60	9	0	11	55
Tight knot	19	26	15	80	28	14	20	7	47	19	35	74
Trunk heartwood	6	17	9	77	38	87	16	100	44	77	25	92
	31	19	30	73	69	54	41	80	100	43	71	77

Isolation tests.—Results of the isolation tests are given in Table 2. In testing 171 western red rot infections, approximately 575 isolations (five plantings per isolation) were made from 342 sources, i.e., loose knot, tight knot, or trunk heartwood.

The combined results for the two age classes show that the percentage of positive isolations was lower from infections that were exposed by pruning than from infections developing in unpruned branches. This difference in percentage is most marked in rot columns that were limited to the loose knots; it is least marked in rot columns that extended into the heartwood of the trunk.

Tight-knot infections best illustrate the effect of pruning on the survival of the fungus. They include a wide range of rot-column lengths intermediate between loose-knot and trunk-heartwood infections. Table 2 indicates that the percentage of positive isolation tests from infections in tight knots exposed by pruning was approximately one-fourth of that from similar infections in unpruned branches. The tight-knot infections were grouped according to the length of rot columns, to compare the condition of the fungus in infections that had penetrated the trunk about the same distance. Where the columns extended 0.01 to 0.10 foot into the tight knots, 10 percent of the isolations attempted from exposed knots were positive as compared to 60 percent from unpruned branches; where the columns extended 0.11 to 0.20 foot, 22 and 94 percent, respectively, were positive; where they extended further than 0.20 foot, 43 and 75 percent were positive. Similar differences existed in the samples from each age class.

Results of the Chi-Square test[8] indicated that the differences in the proportion of successful isolations from tight-knot infections of pruned and unpruned branches were highly significant in both age classes (Table 3). The test was limited to those 11 plots in which infections were present in both pruned and unpruned branches. Similar differences in the survival of the fungus were found on all 11 plots, and suggest that the results of the isolation tests were not determined by variations in locality.

In the foregoing analysis of tight-knot infections, pruned branches had been dead an average of 5 years longer than unpruned branches. This difference may accaccount for differences in the results of the isolation tests, since the tendency for the fungus to die naturally in some knots probably is related closely to the age of the infections. For example, the low percentage of positive isolation attempts from the pruned branches may have resulted from the fact that most of the viable infections had had time to reach the heartwood, leaving a high proportion of inactive or dead infections in the knots. On the other hand, the high percentage of positive isolations from the unpruned branches may have resulted from the fact that most of the viable infections had not had time to reach the heartwood of the trunk. If this is true, the results of isolation tests from infections the same age in both pruned and unpruned branches should be similar. This possibility was investigated by comparing the data for branches that had been dead for approximately the same length of time, as shown in Table 4. Since the proportion of infections in unpruned branches that had developed into heart rot was the same or greater than that in pruned branches, it is apparent that the isolation tests were not biased by the presence of an excessive number of potential heart rot infections in the tight knots of unpruned branches. The table shows that the percentage of positive isolations from tight knots of pruned branches was much lower than that of unpruned branches that had been dead and presumably infected for the same period.

These results confirm those of the preliminary study. They provide proof of the therapeutic effect of pruning on western red rot, even though they also demonstrated that some infections in unpruned

TABLE 3.—RESULTS OF ISOLATION TESTS FROM TIGHT-KNOT INFECTIONS ARRANGED IN FOURFOLD TABLES WITH CALCULATED X^2 VALUES, DATA FROM 11 WESTERN RED ROT SURVEY PLOTS IN WHICH INFECTION WAS PRESENT IN BOTH PRUNED AND UNPRUNED BRANCHES

50(41-55) yr. age class

	Positive	Negative	Total
Pruned in 1939	5	13	18
Unpruned in 1939	12	1	13
	17	14	31

$X^2 = 12.692$

60(56-70) yr. age class

	Positive	Negative	Total
Pruned in 1939	3	24	27
Unpruned in 1939	14	6	20
	17	14	31

$X^2 = 17.258$

[8] Fisher, R. A. Statistical methods for research workers. 5th ed., 319 pp. London. 1934.

TABLE 4.—COMPARISON OF INFECTIONS IN PRUNED AND UNPRUNED BRANCHES DEAD 11-20 AND 21-30 YEARS, AND THE RESULTS OF ISOLATIONS ATTEMPTED FROM TIGHT-KNOT INFECTIONS

Number of years dead	Pruned					Unpruned				
	Total infections		Tight-knot infections—pct.		Trunk heartwood infections—Pct. of total	Total infections		Tight-knot infections—pct.		Trunk heartwood infections—Pct. of total
	No.	Pct.	Of total	Isolation tests positive		No.	Pct.	Of total	Isolation tests positive	
11-20	14	100	64	22	36	25	100	64	75	36
21-30	36	100	53	15	47	14	100	43	67	57

TABLE 5.—SUMMARY OF INFECTION IN TREES DISSECTED ON AND ADJACENT TO THE WESTERN RED ROT SURVEY PLOTS

	Age class					
	50- (41-55) year			60- (56-70) year		
	Dissected in 1939	Dissected in 1949		Dissected in 1939	Dissected in 1949	
		Pruned in 1939	Unpruned in 1939[1]		Pruned in 1939	Unpruned in 1939[1]
Percent of infections in						
Loose knot	15	19	24	10	6	14
Tight knot	77	62	46	73	40	46
Trunk heartwood	8	19	30	17	54	40
Average						
Infections per infected tree (no.)	1.5	1.9	2.4	2.4	2.8	3.6
Heart rot infections per tree with heart rot (no.)	1.0	1.0	1.4	1.6	2.1	1.7
Length of rot column per heart rot infection (ft.)	0.08	0.07	1.10	1.37	1.80	1.66
Number of years branches serving as entrance points for heart rot had been dead	13	19	20	24	28	25
Basis (no. of infections)	(26)	(31)	(33)	(92)	(70)	(43)

[1]From trees adjacent to but outside the original plots.

branches became arrested and never developed heart rot. It is apparent that pruning resulted in the death of the fungus in relatively deep infections of the trunk, particularly in small young trees where rot columns in the heartwood were often but a short distance from the saw cut.

Development of western red rot after pruning.—The incidence of infection in the two age classes had an important bearing on the development of western red rot after pruning. Plots in the 50-year age class had the lowest incidence of western red rot (18 percent of the standing trees were infected) before pruning in 1939. Those in the 60-year age class had the highest incidence (33 percent). After pruning had removed all infections which did not extend inside the saw cut, western red rot was present in 16 percent of the trees in the 50-year-old plots and in 29 percent of the trees in the 60-year-old plots (Table 1). Although the percentage reduction was greater in the older plots, pruning accomplished the greatest good in the young plots because it stabilized infection at a low level. These percentages remained virtually unchanged during the 10-year period ending in 1949 because most of the pruned trees were protected from new infection to a height of 17 feet (the portion of the trunk considered in determining infection). On the other hand, new infections developed in the unpruned trees adjacent to the plots. In comparing western red rot in pruned and unpruned trees, these infections were omitted when it was obvious that they had developed since 1939, i.e., when they occurred in branches that had died since 1939. Infections of just as recent origin could not be recognized when they occurred in branches that had died prior to 1939, and they probably account for the greater average number of infections in unpruned trees (Table 5).

An estimate of rot development after pruning is provided by Table 5, which compares the distribution of infections in the three classes used in Table 2, viz, loose knot, tight knot, and trunk heartwood, in plot trees as of 1939 and 1949, and in the unpruned trees dissected in 1949. The table also shows a number of important characteristics of these infections. It suggests that western red rot infections exposed by pruning developed more slowly in the 50-year class than in the 60-year class. In the younger age class, the incidence of heart rot among such exposed infections as of 1949 was about 2½ times greater than that found in 1939 as compared to more than three times greater in the older age class. The smaller difference in the younger age class is impressive because the incidence of heart rot among infections in unpruned branches on 50-year-old trees as of 1949 was almost four times greater than that found during the original survey.

The effect of pruning on decay development is also reflected in the average length of rot columns in the trunk heartwood (Table 5). In the 50-year-old plots, there was no appreciable difference in the length of rot columns in 1939 and 1949, whereas the rot columns of infections in unpruned branches of this class were many times longer. In the 60-year-old plots the length of rot columns was considerably greater in 1949 than in 1939. A comparison of the average length of rot columns for the pruned and unpruned samples suggests that pruning had very little effect in the older age class. The shorter

length for the unpruned sample probably has no significance. It is explained by the younger average age of such infections. It is evident from the table that on the average the 1949 heart rot infections in both age classes were younger than those observed in 1939, i.e., the average years dead of branches serving as entrance points for heart rot was not 10 years greater than in 1939. This is the case because comparatively young infections that were limited to the knots in 1939 developed into heart rot during the 10 years following pruning, thus lowering the average years dead.

Infections in which *P. anceps* survived for 10 years following exposure by pruning but had not reached the trunk heartwood in 1949 probably would have developed heart rot in time. They may be combined with active infections of the heartwood to provide an estimate of the incidence of heart rot that might have been present when the trees had reached merchantable size. In the 50-year age class, 19 percent of the infections exposed by pruning were active as compared to 54 percent in the 60-year class. In contrast to this, 73 percent of the infections in unpruned branches in the 50-year class and 80 percent in the 60-year class were active.

Similar percentages were not calculated for infected trees, because only a few trees were dissected on each plot. Furthermore, reduction of the results to a tree basis would tend to obscure the effect of differences in the intensity of infection (average number of infections per tree is given in Table 5). Inspection of the data suggested, however, that the percentage of ultimate heart rot would be somewhat higher in both pruned and unpruned trees than in the corresponding individual infections. Regardless of this fact, the percentages shown illustrate the relative benefits of pruning in the two age classes. The incidence of ultimate heart rot among infections exposed by pruning was about 26 percent of that in unpruned branches in the 50-year class and 68 percent in the 60-year class.

The advantages of working with young stands are obvious when the low incidence and intensity of infection on a tree basis and the negligible amount of heart rot in the 1939 sample of the 50-year age class are taken into account. The slight effect of pruning in the older age class is consistent with the higher incidence and intensity of infection and the considerable amount of heart rot present in the sampled stands initially. Pruning was probably undertaken too late to accomplish satisfactory control.

Recommendations

Future losses from western red rot can be reduced to a greater extent than hitherto appreciated by pruning stands less than 60 years old. Infection is usually low in such stands and many silviculturally desirable trees are uninfected and will be protected from subsequent infection to the height that they are pruned. In dense stands, pruning can often be extended to a height of 17 feet in a single operation. When this is impossible, mainly because of the youthfulness of the stands, several prunings at 10-year intervals probably will result in better protection. Even though some infected trees would be included among the crop trees, infections would be of recent origin and limited development. Pruning would eliminate all of the infections that were confined to the branches and result in the death of the fungus in many of the infections that had entered the trunk.

Control measures are not advocated for stands older than 60 years in the Southwest. Western red rot is usually abundant and well established in such stands, and pruning would have little effect on deep-seated trunk infections. Furthermore, it would be of no value as a protective measure, because a majority of the dead branches below 17 feet are no longer susceptible to attack by *P. anceps*.

Summary

Studies were made in 1947 and 1949 to determine the extent to which diseases might offset the beneficial effects of pruning young ponderosa pine in the Southwest.

The 1947 study was conducted on nine areas in the Coconino, Kaibab, and Sitgreaves National Forests of Arizona. Observations were limited to 932 crop trees that had been pruned between 1933 and 1940. Ninety-seven of the trees were felled and dissected for intensive study. Cultures were made from specimens of diseased branches, knots, and the trunk. Results of the study indicated that:

1. Knots exposed by pruning are unimportant as entrance points for disease.

2. The only fungus warranting serious consideration in future pruning operations is *Polyporus anceps*, the cause of western red rot, which enters trees through recently dead branches.

3. This fungus is often well established in knots before pruning is undertaken: it had penetrated the tight knots (tight knot, portion of the branch embedded in the trunk before the branch died, as compared with loose knot, the portion of the branch overgrown after the branch died) in 73 percent of the infection that extended inside the pruning cut; and of these knot infections, 34 percent had continued into the heartwood.

4. Isolation tests suggested that pruning arrests or results in the death of the western red rot fungus in some of the knot infections that have not reached the heartwood.

The 1949 study was made in conjunction with the examination of 14 western red rot survey plots in the Carson, Cibola, and Santa Fe National Forests of New Mexico and in the Kaibab and Sitgreaves National Forests of Arizona. When the plots were established in 1939, 51 infected trees had been dissected. In 1949, 67 infected trees were dissected: 41 were plot trees that had been pruned in 1939; 26 were infected unpruned trees adjacent to the plots. Two age classes, 50- (41-55) year and 60- (56-70) year, were used in summarizing the results of the study.

Isolation tests of 171 infections confirmed the results of the pre-

liminary study and provided proof of the therapeutic effect of pruning on western red rot.

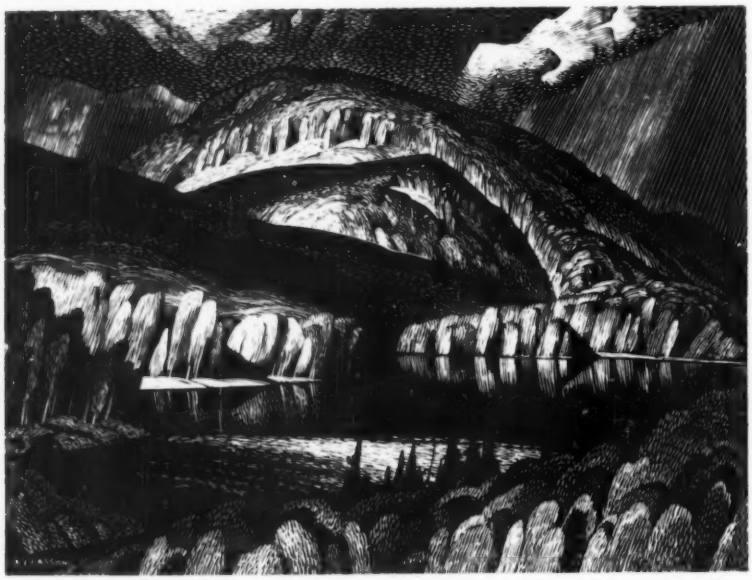
1. The percentage of positive isolations was lower from infections that were exposed by pruning than from infections that occurred through unpruned branches. This difference was most marked in infections limited to loose knots; it was least marked in infections that had reached the heartwood.

2. The percentage of positive isolation tests from tight-knot infections exposed by pruning was about one-fourth that from similar infections in unpruned branches. The difference in percentages was most marked in the case of infections limited to the outer 0.1 foot of the tight knots; it was least marked in infections that extended further than 0.2 foot into the knots. The lower percentage for tight-knot infections of pruned branches was found to be statistically significant in both age classes.

During the 10-year period 1939 to 1949, infections exposed by pruning developed more slowly in the 50-year age class than in the 60-year class.

In the younger age class 19 percent of the infections exposed by pruning were active and were either already in the heartwood or probably would have developed into heart rot; in the older age class 54 percent of the infections were of this type. In contrast to this, 73 percent of the infections in unpruned branches in the 50-year class and 80 percent in the 60-year class were active.

Future losses from western red rot can be reduced to a greater extent than hitherto appreciated by pruning stands less than 60 years old. Control measures are not advocated for older stands in which the decay is usually abundant and well established.



Poplar. *From the painting by J. A. Casson, commissioned by the Canadian Pulp and Paper Association. One of a series of forest scenes by distinguished artists depicting the chief forest species presently harvested by that industry for pulpwood.*

Notes

Growth of Scotch Pine Plantings on the Cloquet Experimental Forest[1]

Experience with introduced species in forest plantings in the Lake States is very limited, first because we have an abundance of native species well suited to various site conditions, and second, because introduced species have not been generally successful in the past.

It is of interest therefore to record the results obtained over a period of about 35 years with plantations of Scotch pine (*Pinus sylvestris*) at the Cloquet Experimental Forest. The Scotch pine used in these plantings was grown from seed furnished by the U. S. Forest Service in 1912 and obtained by them from Russia. The records available indicate that it was of northern European origin. This no doubt accounts for the fact that these plantings have shown relatively little winter injury, even during the severe winter of 1947-48. Damage and some killing of Scotch pine was prevalent in Lake States plantings during 1947-48, particularly in plantings made with stock grown from seed collected in European countries with climates milder than ours (*1*).

The earliest plantings of Scotch pine seedlings grown from this northern seed were made in 1915 with 2-0 stock, and the last plantings were made in 1918 with 2-2 and 1-2 stock. Plantings were made on recently cutover areas with a cover of light to heavy brush, and scattered reproduction of native species. With the exception of one plot (Number 4), all plantings were made on light sandy soil classed as Omega sand. Plot 4 was planted on a slightly heavier soil classed as Münger fine sandy loam; the description indicates that it has a heavy brush cover.

The plots varied in size from 0.1 to 0.25 acre. More than a dozen such plots were established, but on many of them only scattered Scotch pine survivors remain because the plots were taken over by natural regeneration of red and jack pine. However, on seven plots a sufficient number of Scotch pines survived for growth measurements. Annual counts and measurements were made during the first 10 years after establishment and again in 1948.

A progress report made on the planting 5 years after establishment indicated the definite superiority of transplants over seedling stock (*2*). The survival, growth, and volume data on these plots 10 years after planting and in 1948 (33 to 35 years after planting) are summarized in Table 1. On plots larger than 0.1 acre, measurements are limited to 0.1-acre samples of what appeared to be representative parts of the plots.

Because no volume tables were available for Scotch pine grown in the United States, jack pine volume tables were used. Since the Scotch pine is unusually straight and has very little taper the jack pine tables should apply reasonably well. The basal area in the first four plots is relatively high for any species at this age, and in the remaining three plots it is not unsatisfactory. It is interesting to compare the yield of some of these plots with those given by Schlich (*3*) for European-grown Scotch pine on an average site, which this is presumed to be since it is an average site for jack pine. By interpolation, the yield table for Scotch pine gives the number of stems for a 34-year-old stand as 1,400, the basal areas as 110.2 square feet, the average diameter as 3 to 4 inches, the average height as 32.6 feet and the total cubic volume as 2,564 cubic feet. All of the Cloquet plots have less than the normal number of trees, but the average diameter and height are greater. Three plots have a greater yield than is shown in the table, and 4 have smaller yields.

Plots 2, 4, 5, and 6 contained a considerable mixture of native red and jack pine, which came in as natural reproduction since establishment of the plots. The number of trees and volume made up by this natural reproduction of native species is of interest. Since no age determinations were made on the red and jack pine intermixed with the Scotch pine, no direct comparisons can be made. In general, however, the intermixed jack pine was about the same diameter as the Scotch pine, whereas the red pine was somewhat smaller. The total volumes for plots 2, 4, 5, and 6, including the Scotch, red and jack pine, were 3,280, 3,196, 2,486, and

[1] Published as Scientific Journal Series paper No. 2562 of the Minnesota Agricultural Experiment Station.

TABLE 1.—GROWTH OF PLANTED SCOTCH PINE ON THE CLOQUET EXPERIMENTAL FOREST

Plot No.	Class of stock	Date planted	Stand 10 years after planting: No. trees per acre	Stand 10 years after planting: Average height	Age 1948	Stand and volume per acre, 1948: No. trees	Average d.b.h.	Basal area	Average height	Volume	
				Feet	*Years*		*Inches*	*Square feet*	*Feet*	*Cubic feet*	*Cords*
1	2-2	1918	980	8	34	840	5.7	148.8	37	3040	30.9
2[1]	1-2	1916	690	8	35	710	5.9	136.7	38	2850	29.1
3	1-2	1918	620	7	33	570	6.3	119.9	37	2260	23.6
4[1]	1-2	1916	900	9	35	700	6.1	140.1	38	3010	29.9
5[1]	2-1	1916	810	5	35	480	5.6	82.2	34	1590	16.5
6[1]	2-0	1915	580	3	35	610	5.5	101.5	35	1940	19.1
7	1-2	1918	500	6	33	480	6.4	106.6	36	2010	20.3

[1]These plots contained volunteer stems of red and jack pine which are not included in this tabulation.

TABLE 2.—COMPARISON OF THE GROWTH OF SCOTCH AND JACK PINE

Species	Class of stock	Date planted	No. trees	Ave. d.b.h.	Basal area	Average height	Volume	
				Inches	*Sq. ft.*	*Feet*	*Cu. ft.*	*Cords*
Scotch pine	2-2	1918	840	5.7	148.8	37	3040	30.9
Scotch pine	1-2	1916	710	5.9	136.7	38	2850	29.1
Jack pine	2-2	1918	710	5.2	105.9	38	2110	21.5
Jack pine	normal yield table	34 yrs.	1165	4.5	117.0	38	2650	—

2,443 cubic feet, or 33, 31.5, 24, and 23 cords per acre, respectively.

It is interesting to compare the growth of Scotch pine with jack pine planted at the same time on the same site. Table 2 gives this comparison.

No firm conclusions can be drawn from such limited data, but the Scotch pine does seem to have grown a little faster in diameter. This, of course, resulted in greater volume. The jack pine plot used for comparison is not too far from the normal given by Brown and Gevorkiantz. (*4*).

From the foregoing figures it seems that this variety of Scotch pine holds some promise as a forest tree in the Lake States. Early performance does not tell the whole story and the subsequent behavior of these plantings will be followed with interest.

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How to Determine When an Area Was Logged

In some of our research we have had occasions to determine the approximate date that timber was felled, or that a certain area was logged, and we have had requests from others for information on methods of post dating a logging operation or determining the year of a trespass cutting. Some woodsmen are able to quite accurately date a previous operation by the extent of aging of the sawdust, or in older operations by the condition of the stumps. Both of these methods require special knowledge, experience, and good judgment on the part of the investigator, and his conclusions are debatable in court proceedings.

One of the simplest and most positive methods we have found is to look at the dates on discarded Copenhagen snuff cans found in the area. Many loggers regularly use "snoose" in the woods, and no respectable "snoose chewer" will buy or use Copenhagen that is more than a couple of weeks old. The date of packing is stamped on the bottom of every snuff can and often remains legible for several years after being discarded in the woods.

In older operations we have used the reorientation of perennial "conks" on trees or snags that were cut or knocked down in the logging operations. The pore surface of a conk always grows on the underside, so when a tree changes from an upright to a prone position, any attached perennial conk that remains alive will put out a new pore surface at right angles to the original one. Since a new pore layer is added each year, the number of years the tree has been down can be determined by cutting into the conk and counting the number of pore layers that have been added in the new position.

Another method we have found useful in older areas is the dating of logging wounds on uncut trees in the logging area. Falling trees or skidding operations that have partially "skinned" young trees or have knocked patches of bark from them produce wounds that are easily and definitely dated to the year of operation. A cross section through the callus growth surrounding such wounds shows clearly the annual ring from which the bark was removed and the number of years of growth that have since been added. The number of annual rings added outside the wounded ring represents the number of years since the logging operation.

Often an operation may be accurately dated by an examination of the annual rings in residual trees to determine the date of response to release after logging. When using increment borings for this examination, it may be necessary to examine the rings at four points on a tree, because the increased ring width is not always evident at all points on some trees. The increased growth ordinarily starts with the first growing season following the logging.

It is better to make the determination from several "snoose" cans, from several conks, from several logging wounds, or from conks or wounds on several residual trees, than from a single one, and best if it can be confirmed by the use of two or more of the methods.

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Soil Erosion in Copper Basin

Those who have weathered a thunderstorm in the denuded Copper Basin of southeastern Tennessee have seen the muddy waters rush down the gullies with their load of silt. More than a century of human activity has wrought drastic changes in this 23,000-acre basin which was once densely forested. Here for all to see is the evidence of how water and soil interact when forest or other protective vegetation is lacking.

In 1934 Dr. Charles R. Hursh of the U. S. Forest Service started important forest influences research in the Copper Basin. On two small watersheds of 5 and 15 acres he accurately mapped the topography and installed a series of erosion gages. The land was completely denuded and so severely eroded that all of the topsoil and a large part of the original subsoil was gone. It is representative of some 4,450 acres surrounding the copper smelting plants in the center of the Basin.

In 1951, TVA foresters remeasured the erosion gages and resurveyed the topography of the two small watersheds. Here, where 50 inches of rain beats down on the barren hills each year, they found as much as 16 feet of soil had disappeared in the path of advancing gullies. Of course, other parts of the watersheds had lost much less soil. On the average, 1.8 feet of soil had eroded from the 5-acre watershed, and 1.9 feet from the 15-acre watershed during the 17 years. If we convert this soil loss to a yearly basis we find that a layer of soil averaging 1.3 inches deep has gone off the bare hills each year. For the entire 4,450 acres in the denuded area it means an annual loss of 482 acre-feet of soil. This is 777,600 cubic yards, an earth-moving job of major proportions.

Much of this silt finds its way to the Ocoee River and is deposited behind TVA's Ocoee No. 3 Dam. TVA engineers allowed for this condition in their design of the dam and provided two large sluices for silt removal. They also built this dam primarily to divert water into tunnel intakes rather than to store water for flood control. Nevertheless, silt deposits in this reservoir provide a convenient check on the estimated quantity of soil eroded from the Copper Basin.

When completed in August 1942, Ocoee No. 3 had a total storage capacity of 14,300 acre-feet, of which 9,540 acre-feet were normally useful for power and flood control. By August 1950, 8 years after closure, some 4,455 acre-feet of sediment had settled in the reservoir. During this same period an estimated 3,900 acre-feet had eroded from the bare portion of Copper Basin, plus an undetermined amount from an additional 18,550 acres in the Basin subject to less severe erosion. Some of the sediment settles out before it reaches the reservoir, but most of it undoubtedly does enter the reservoir and is deposited there.

These are the quantitative effects of erosion under conditions of humid climate, high intensity rainfall and easily eroded soils. It is an extreme example, but it does indicate the potential erosion from totally denuded lands. It is a tragic example of what may happen when the land loses its vegetative cover.

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Slash Pine Sprouts

The accompanying photos show slash pine sprouts developed from trees planted as seedlings in January, 1948, and subject to a fire in January of 1951 in Wayne County, Miss. The area involved was a low wet flat which had standing water among the rough at the time of the fire. Although the original leader of the young slash pine was killed, new sprouts developed at the base of the trees in the spring following the fire. The photographs were taken in the spring of 1953.

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Editor's note.—A forthcoming article in the JOURNAL, "Root Collar Sprouts in Pine," will discuss the botanical character of such sprouting. Sprouting of slash pine is not unique. Reports of it, however, are uncommon.

Reviews

Periodical Forestry Literature in the U.S.S.R.

In the publication *For Socialist Agricultural Science* (2-3 issue of 1953), successor to *Interagra* which was notable chiefly for its distortion of information about agriculture and forestry in the western democracies, there is a summary in English of the three forestry journals published in the U.S.S.R.

The leading one is *Lesnoye Khoziaistvo* (*Forestry*) "which is an organ of the Ministry of Forestry of the U.S.S.R." In this basic publication, described as a scientific-technical journal, issued monthly, are discussed all phases of "the huge Soviet forest industry."

Les i Step (*Forest and Steppe*) is another monthly scientific journal, the "organ of the Chief Administration of Shelter Belt Forestry in the Council of Ministers of the U.S.S.R. . . . This journal is in its fourth year of publication, having been started in connection with the carrying out of the vast plan of changing nature in the broad reaches of the Soviet land."

Described as "the monthly production-technical economic journal" *Lesnaya Promyshlennost* (Forest Industry) "is the organ of the Ministry of Forest Industries of the U.S.S.R."

It will be observed that these periodicals are all organs of the government. So far as is known, there is no such thing as a professional or technical journal of forestry published in the U.S.S.R. by a nongovernmental professional forestry society or a citizens forestry association, if indeed such organizations are permitted inside the Iron Curtain.

For Socialist Agricultural Science is the journal of the Czechoslovak Academy of Agricultural Sciences, published five times a year at Praha (Prague). It is printed mostly in Russian with occasional summaries in English, French, German, and of course Czechoslovakian.

HENRY CLEPPER.

Raw Materials for More Paper: Pulping Processes and Procedures Recommended for Testing.

F.A.O. Forestry and Forest Products Study No. 6. 172 pp. Columbia University Press, New York 27. 1953. $2.

In December, 1952, a group of 32 pulp and paper specialists from many countries convened in Rome under the sponsorship of F.A.O. Their purpose was to provide answers to questions such as (1) what are the possibilities for manufacturing pulp and paper from the various kinds of raw material available? (2) what processes should be used, and for what kinds of paper? (3) if the use of new materials is technically possible, is it considered to be a feasible commercial venture? and (4) what are the comparative manufacturing costs? For two weeks these experts reviewed and revised two reports with appendices specially prepared for the consultation by six of them. The sense of the meeting and the conclusions reached are presented in this book.

The book is divided into two parts. In the first is reviewed the status of current practice and the application of various pulping processes to new fibrous materials. Pulping procedures and tests for such materials are considered in the second part in a manner which will allow comparisons to be made of results obtained in different laboratories, without wide duplication of effort.

A vast amount of information has been condensed into this small book. One learns how the fibrous raw materials, especially broadleaved woods and nonwood materials, are manufactured into groundwood, various semichemical pulps (chemigroundwood, cold caustic soda, neutral sulfite, sulfate semichemical) and the usual chemical pulps—sulfate, soda, and sulfite. Information is also given on the uses, species suitable, bleaching, operating data, byproducts, pollution, and recovery of heat and chemicals from spent liquor or burning of spent liquor. Processes are available for pulping practically all cellulosic fibrous materials.

One chapter is devoted to a discussion of the procurement, storage, and preparation of agricultural residues as well as detailed consideration of pulping processes for nonwood materials. Processes in commercial use for pulping nonwood materials are the lime, soda, cold caustic soda, sulfate, neutral sulfite or monosulfite, caustic soda-chlorine and mechanochemical.

The suitability of fibrous raw materials (various species) for different paper products is considered in some detail and several tables indicative of possibilities are presented.

The consultants have elected to present certain economic aspects of the problem by means of 17 cost data sheets which give hypothetical consideration to several types of materials processed by common methods. These must be interpreted with caution because only careful investigation and analysis of a projected pulping operation can establish whether operation will prove economic.

In view of the broad coverage, summaries or "case histories" have been prepared for the pulping of four raw material groups, namely, tropical broadleaved woods, straw, sugarcane bagasse, and bamboo.

Procedures are recommended for investigation of new fibrous raw materials for paper. Included are (1) directions for collection of samples, (2) anatomical, physical, and

chemical testing methods on the raw materials, (3) pulping procedure to use on wood, straw, bagasse, bamboo, and other nonwood materials, (4) tests for bleaching conditions and requirements, and (5) pulp testing procedures. The technique of reference pulps as suggested appears promising and merits careful trial.

These men must be commended for the preparation, in such a short period, of this summary which will be of considerable assistance in the inevitable exploration for fibrous raw materials for the paper industry. It is noteworthy that they have achieved this in spite of diversified backgrounds and languages. The book is well printed in readable type. It should be a handy reference book.

IRVING H. ISENBERG.

Conk Rot of Old-growth Douglas-fir in Western Oregon.

By John S. Boyce and J. W. Bruce Wagg. 96 pp. Illus. Bul. 4, Oregon Forest Products Laboratory, Corvallis, Ore. 1953.

Heart rots are notorious as sources of expensive errors in cruises, management plans, and logging practices. This is particularly true of conk rot, caused by *Fomes pini* (Thore) Lloyd, which has decayed billions of board feet in the valuable stands of old-growth Douglas-fir still remaining in Oregon. The information presented in this bulletin makes it possible to cruise these stands more accurately, increase net yields by logical timing of logging operations, and reduce logging costs by proper bucking.

The study is based on dissections of 292 Douglas-firs on 14 plots in highly defective stands, and examination of standing trees on 459 quarter-acre plots selected without reference to decay. Height above ground of both the base and the top of the average column of conk rot increased with increasing stand age, as did the extent of this column above the highest and below the lowest external indicator.

Damage was greatest on steep and upper slopes, southerly aspects, shallow soil, soil with excessive drainage, and soil with high nitrogen content. In many of these situations, temperature may be the controlling factor. Vine maple, vanilla-leaf, oxalis, and rose were most common, and salal, twinflower, and rhododendron were least common where incidence of conk rot was high. No relationship was found between conk rot and elevation, curvature of slope, or soil texture or acidity.

Earlier work by the senior author[1] indicated that conk rot progresses rather slowly. This conclusion is substantiated by the present study, in which the maximum rate of decay of stand volume was found to be only about one-third of one percent per year.

Abundance of conk rot in a given stand is shown to fluctuate in cycles. Most infections occur in dominants. The fungus then gradually encroaches on the sapwood. Infected trees decrease in vigor and eventually succumb to competition. Neighboring trees are stimulated by this release, whereupon many of them become infected. This process occurs at least twice during the life of a typical stand. The cycles are fairly distinct, and are big enough to require consideration in logging plans.

For example, the average sound volume of the site II stands in this study was 106 M board feet per acre at 210 years, 98 M at 250 years, 115 M at 290 years, 100 M at 350 years, and 121 M at 390 years. Common policy in this region has been, whenever possible, to log the most defective stand first.

Since these data indicate that many of our defective stands may actually be improving in condition, it is evident that old-growth Douglas-fir forests should be carefully analyzed in the light of the information presented in this bulletin.

T. W. CHILDS.

[1]Boyce, J. S. Decay and other losses in Douglas-fir in western Oregon and Washington. U. S. Dept. Agric. Tech. Bul. 286. 59 pp. Illus. 1932.

Resources and the American Dream.

By Samuel H. Ordway, Jr. 55 pp. Ronald Press Co., New York. 1953. $2.

A lawyer by profession, a former civil servant and naval officer, Mr. Ordway is now vice president of the Conservation Foundation and the author of *A Conservation Handbook*. His new book—actually, it is a long essay—discusses the effect of expanding pressure on our natural resources by population growth and increased consumption of resources by industrial demand.

"The American Dream" of the title is the concept of an ever rising standard of living based on bountiful raw materials and maintained by a technology that will produce new foods, fibers, and similar products when, and as, needed. Mr. Ordway believes that new discoveries in science and the opening up of new sources of raw materials in the sea, the air, and the soil, do not promise unlimited expansion in resource use, but merely postpone the time when the limit of expansion will be reached.

In support of his conclusion he advances the "theory of the limit of growth." In brief, this theory advocates that society should control consumption of raw materials, especially those in short supply, to their capacity for replacement. He believes that under our free enterprise system adjustments can be made voluntarily to bring drain into balance with supply, provided we distinguish needs from wants. Land-use planning and rationing of the distribution of raw materials—government, industry, and technology cooperating—are advocated.

"The industrial pattern of today has brought us health, wealth and leisure in unprecedented degree. It has made us reliant on machines—less reliant on ourselves. Success has led us to believe that the earth is a cornucopia, and the machine a god. It has led us to a false faith in man's omnipotence."

Such is Mr. Ordway's belief, and his arguments in support of it deserve the thoughtful study of every person engaged in natural resource

management. He writes in a simple, unaffected style, avoiding "double-dome" words and involved syntax.

Even if you do not agree with him, you will not fail to understand him.

HENRY CLEPPER.

Total Atomic Defense.

By Sylvian G. Kindall, 224 pp. Richard R. Smith, Publisher, Inc., West Rindge, N. H., 1952. $3.

This book, dealing with the potentials of atomic warfare directed against this country, clearly states the author's views on what may happen and what should be done.

The author warns that civilian defense measures based on experience with TNT bombs in London during World War II are pitifully inadequate to cope with atomic bombs. He points out that a single atomic bomb has within it more power than all of the TNT bombs dropped on London in six years, and that targets for atomic bombs will be the subject of a carefully planned operation. The vulnerability of our large cities is apparent and as long as factories producing arms and munitions are located in cities, the city, large or small, runs the risk of attack. Dispersal of factories to the perimeters of cities is the first step recommended. Dispersal of populations of cities follows so that the number of people a bomb can kill will not be great enough to make the mission a rewarding one.

The author, assuming that 5,000 deaths are the enemy's minimum figure for use of an atomic bomb, recommends that a city wishing to accomplish atomic defense through dispersal set its maximum allowable population density at 1,000 inhabitants per square mile. Federal aid for dispersal is recommended, the costs of which are estimated at 15 billion dollars.

The effective use of incendiary parchments on the wheatlands of the West is foreseen and the introduction of "strip farming" is recommended as the most logical defense.

The major topic of interest to foresters is the prediction that, if war comes, tons of incendiary parchments will flutter down from the skies into the forests of the West, causing untold damages. The author points out that in the early days the beaver kept many of the small streams cross-dammed and flooded and that the resulting water spreading materially prevented the forests from being destroyed. Therefore, he has recommended restocking the forests of the West with beaver as a long range permanent defense program. As a short range program, building of firelines along divides and lateral ridges and mechanical damming of small streams are recommended. The use of rainmaking devices is also mentioned. From the reviewer's standpoint, the subject of protecting the forests of the West from enemy attack has been dealt with rather lightly.

The major theme of the book is that measures for protection against the atomic bomb are possible but that these steps must be taken now.

BOYD L. RASMUSSEN.

Virginia Pine: Reproduction, Growth and Management on the Hill Demonstration Forest, Durham County, N. C.

By G. K. Slocum and W. D. Miller. 52 pp. Illus. North Carolina Agricultural Experiment Station, Raleigh, N. C. 1953.

Every once in a while there comes from a school forest, experiment station, or other forest research group, a publication of immediate value to the operating or practicing forester. This is such a report. Containing carefully prepared cubic foot, cord, and board foot volume tables, yield tables, and data on current and mean annual growth for the species, all of which are from adequate basic data, this bulletin (number 100) will frequently be consulted by persons who have occasion to work in Virginia pine.

Likewise, the specific findings with respect to the silvicultural methods required to reproduce and handle the subsequent stand will be of much assistance to the manager of forest stands of this species.

Although the reader is cautioned that findings on the Hill Forest should not be applied to other parts of the range of the species (approximately 800,000 acres in North Carolina alone) without due allowance for variations in climate, soil, stand composition and various other factors, this reviewer believes the findings will apply throughout the range but particularly in North Carolina and Virginia.

Some of the findings in this study are of particular significance.

Virginia pine produces dense pure stands on old fields; under forest conditions stands will develop a hardwood element of over 50 percent unless weeding is applied at an early age.

The species meets hardwood competition more successfully on dry than on moist sites.

Dominant trees produce annual crops of cones starting at 15 to 20 years of age.

Germination values are usually less than 50 percent.

Virginia pine is an excellent pulpwood species and average yields are approximately one cord of stacked wood per acre per year. The high sawtimber yields shown are surprising, but it should be pointed out that fully stocked stands at maturity are seldom encountered.

Mean annual increment in cubic feet inside bark culminates at approximately 45 years of age.

The species is very susceptible to fire, windthrow, and ice damage; hence thinning in stands over 12 years of age is not practical because of the hazard of ice and wind damage.

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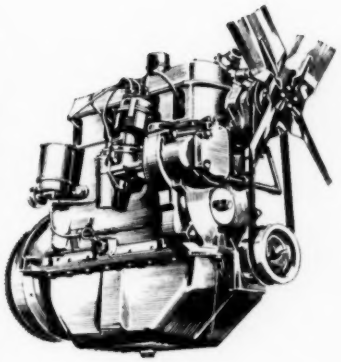

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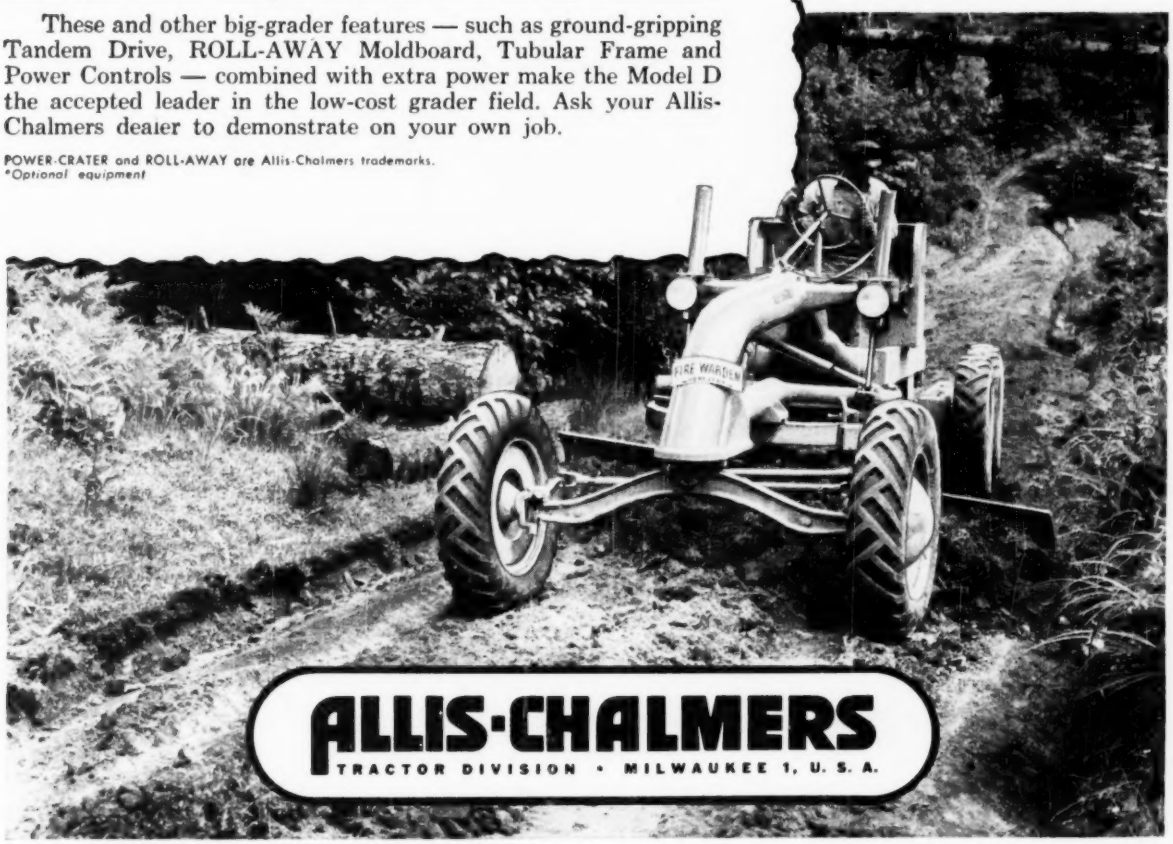

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It is refreshing to encounter a frank recognition of the drastic treatment needed to reproduce the species and the undesirability of thinnings in middle-aged stands. This is especially noteworthy in view of the many sins and errors still being committed in the name of forestry in the southern pine region by so-called "selective cutting."

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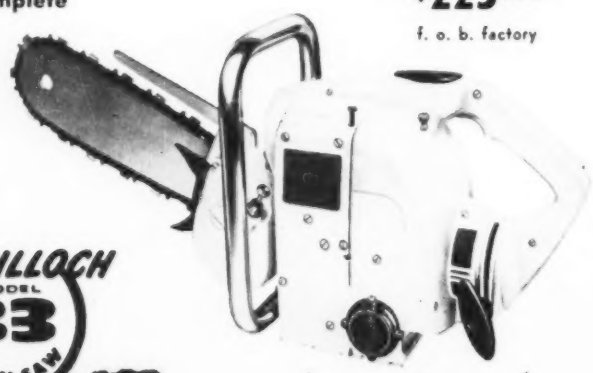

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Planned Management of Forests.

By N. V. Brasnett. 238 pp. St. Martin's Press, New York 17, N. Y. 1953. $3.50.

The appearance of a new British text in forest management invites comparison with American texts in the same field. The British viewpoint parallels that of Americans in that both peoples draw heavily upon the classical management of the western European forests at the same time that they are concerned with the initiation of regulation in large tracts of previously unmanaged forests. The British forestry schools train not only for the British Isles, but also for the British colonies and to some extent for the other nations of the Commonwealth. Mr. Brasnett, the author, lectures in forest management at Oxford, drawing upon many years of experience in Kenya and Uganda.

As a result of this combined interest in both the intensive management of the forests of western Europe and the extensive control of the vast tropical forests, Brasnett's approach is quite similar to that of American writers, and his book is of considerable value to American practitioners. His writing style is terse and even epigrammatic. Major management topics are disposed of in chapters of a few pages or even in a single sentence. As a result, details are somewhat lacking although the basic principles themselves stand out.

The text is divided into three parts, of which the first two cover the classical ground of American management texts. Part I deals with the growth and organization of forest crops, and touches briefly upon such matters as growth, types of rotation, and forest organization.

Part II is titled "Planning management." The author treats the organization of working plans (management plans), and the compilation of data to be included in them. His discussion of sites, vegetation types, and forest history shows a deep regard for the basic ecological nature of forest management, and the necessity of making management plans conform to what

is silviculturally practicable. More than half of this section of the book is devoted to regulation of yield. The conventional European methods are presented briefly, and their application to previously unmanaged tropical forests is touched upon. This part of the book concludes with a discussion of putting the plan into operation, maintaining records, and revising the plan periodically. These first two sections contain little not found in American management texts, but the presentation is so precise and succinct as to justify perusal.

Part III is an historical summary of the "Development of forest management in western Europe." Here is found a well-digested summary in the English language of the evolution of classical forest management from medieval France to the present day. Reading this section, the American forester will emerge not only with a far better understanding of how our various regulation methods were evolved, but he will also see the very great extent to which these methods have been tailored to fit the silvicultural problems of the time, the place, and the forest type. This part of Brasnett's book should prove particularly valuable to American forest managers and students.

STEPHEN H. SPURR.

Checklist of Native and Naturalized Trees of the United States (Including Alaska).

By Elbert L. Little, Jr. 450 pp. Superintendent of Documents, Washington, D. C. 1953. $2.

This is Agriculture Handbook No. 41, Forest Service, U. S. Dept. Agric., and was prepared under the direction of the Forest Service Tree and Range Plant Name Committee consisting of William A. Dayton, Raymond D. Garver, Bert R. Lexon, and Lawrence W. Smith, in addition to the author. It is the third official list published and supersedes the check list of 1927 which has been out of print for some time.

The book covers 1,027 trees. It gives their accepted scientific names, their etymology, current synonyms, approved common names, range, bibliographic citations, and other information. The list conforms to the International Rules of Botanical Nomenclature; the previous check list to the now obsolete American Code of Nomenclature. It is a work to serve not only the forester, student, and others interested in trees, but also the botanist. Its purpose is to encourage uniform usage of names for trees, and its appearance has been awaited to supply a definite need. It is likely that western foresters will protest the change of Douglas-fir from *Pseudotsuga taxifolia* to *Pseudotsuga menziessii* and that southerners will consider it inconvenient to refer to slash pine as *Pinus elliottii* instead of *Pinus caribaea*. Changes in the scientific names of important trees species

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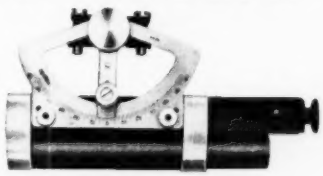

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presented in this new check list are not, however, very numerous and the existence of a recognized reference to which all may conform is most welcome. This is, perhaps, especially true for foresters who studied dendrology before the change from the American to the international nomenclature rules.

The check list is confined to trees, which for the purpose of the list are defined as woody plants with a single erect stem or trunk three inches or more in d.b.h. and at least 12 feet in height except that large willows and other trees with more than one trunk springing from the same root system are also included.

A. M.

Publications of Commonwealth Forestry Bureau

The JOURNAL draws its readers' attention to the advertisement, on page 80, of the Commonwealth Forestry Bureau, Oxford, England, an active, experienced organization that provides a synopsis of current world forestry literature in English. This bureau, for the past 14 years, has been responsible for the issue of a journal, *Forestry Abstracts*, which every quarter publishes the cream of the world's literature in forestry; forestry, that is to say, in its widest sense, from fundamentals and biology, through silviculture, management, etc. to utilization, economics, and policy.

The latest number, Vol. 15 (1) carries between its green and buff covers no less than 1,024 abstracts and titles (carefully classified and cross-referenced acording to the Oxford Decimal Classification for Forestry), culled from literature in about 2 dozen languages, and each volume is now running at a rate exceeding 4,000 notices a year. A copious annual index is also provided, by author, woody species, subject and region, so that unfamiliarity with the classification system need be no handicap. Backing this published record is the still more comprehensive Card Index built up by the Bureau at a rate of 20,000 cards a year for the Imperial Institute of Forestry where the Bureau, though an entirely independent body, is housed.

The Bureau claims world-wide coverage of its field and is continually on the prowl for fresh publications or articles in "marginal" magazines, etc., no matter what the language. The validity of its claim may be judged from FAO's recent publication, in its Forestry and Forest Products Studies series, of the *Forestry Abstracts Coverage List* which is surely the most comprehensive compilation of forestry literature yet printed.

Few people outside those in research and education, who have been taking these *Abstracts* for years, know of or utilize this cheap but invaluable source of information which should constitute a basic source of reference in the working forester's home or office. For the logger, sawmiller, and industrial forester a reprint of sections 3, 7, and 8 only is also available under the title *Forest Products and Utilization Abstracts.* A sample copy of either publication can be obtained by writing direct to the publishers, Commonwealth Agricultural Bureaux, Central Sales Branch, Franham Royal, Bucks, England.

Publications of Interest

The National Lumber Manufacturers Association research affiliate, Timber Engineering Company, Inc., 1319 18th St. N.W., Washington 6, D. C., has issued its *Annual Report: 1953.* Work of the research agency includes two phases: the study of special products

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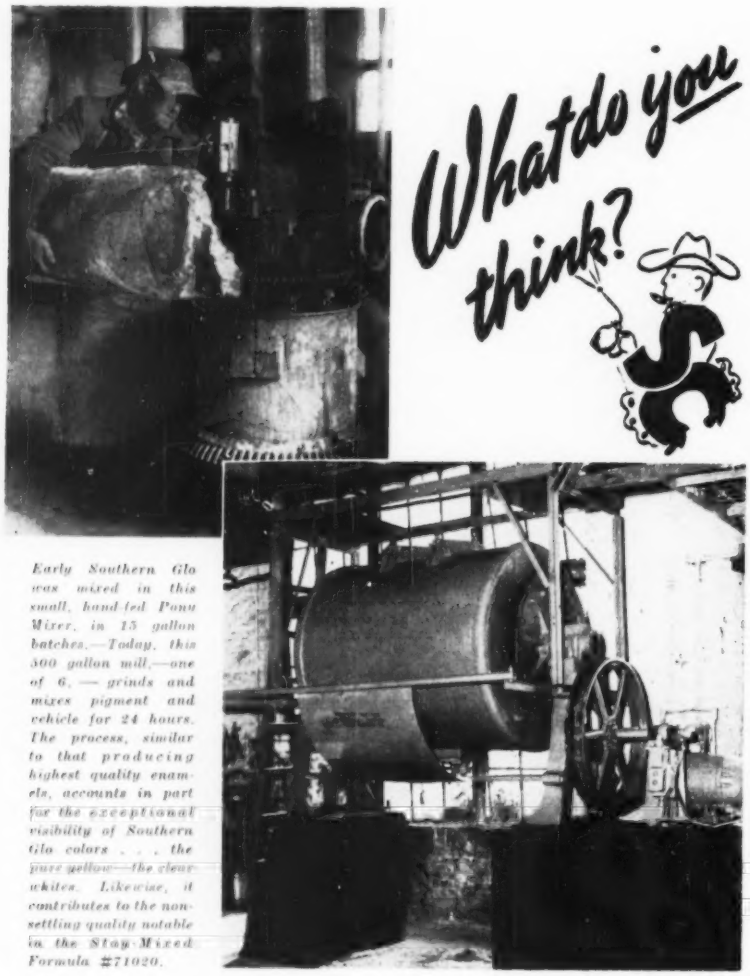

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* * *

Foresters dealing with teachers, or foresters engaged in any type of educational work will find three bibliographies helpful. These are: *Bibliography of forest industry educational materials*, available through the American Forest Products Industries, Inc., 1816 N St. N.W., Washington 6, D. C.; *A Conservation Bibliography*, Folder 66 of the Extension Service, University of Connecticut, Storrs; and *Free and Inexpensive Materials for Conservation Education*. The latter is published by the National Association of Biology Teachers, and copies are available at 10 cents from Dr. Richard L. Weaver, P.O. Box 2073, Ann Arbor, Mich.

* * *

A 29-page bulletin, *Logging Safety*, has been published by the State University of New York College of Forestry, Syracuse. It consists of extracts from papers presented at the May, 1953, Logging Safety Conference held by the college and the Northeastern Loggers Assn. Purpose of the publication is to bring to the attention of industry leaders the problem of high accident frequency and severity rates in logging.

* * *

Growing Trees in a Free Country is a 20-page booklet outlining and explaining the forest policy of the Forest Industries Council. This council represents the American Pulpwood Association, American Paper and Pulp Association, and the National Lumber Manufacturers Association. Copies may be obtained from any one of the three organizations. Three addresses, in the order given above, are: 220 E. 42nd St., New York 17; 122 E. 42nd St., New York 17; and 1319 18th St N.W., Washington 6, D. C.

* * *

There are several methods of delivering a speech before an audience. However, those dealing with "policy" or those concerned with highly scientific and technical matter are quite often read from a prepared paper. How to write and deliver such speeches is very entertainingly and instructively covered in "*Mr. Chairman . . . Distinguished Guests . . .*," a pamphlet that may be secured from Standard Oil Company, Room 1626, 30 Rockefeller Plaza, New York 20.

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Current Literature

Compiled by MARTHA MEELIG, *Librarian, State University of New York College of Forestry*

Range Management Section Compiled by FRANCES FLICK, *Library, U. S. Department of Agriculture*

General

Forest Research Programs; A Selected Bibliography of United States Literature. Comp. by Frances Flick. 4 pp. U. S. Dept. of Agric. Library, Washington 25, D. C. 1953. Library List No. 58.

The Forester's Handbook. By H. L. Edlin. 416 pp. Illus. Thames & Hudson, Ltd., London W. C. 1. 1953. 35/-.

Forestry in Western Samoa; A Report by Colin Marshall with a Supplementary Report by T. S. Thompson, 1950. 63 pp. Government of Western Samoa, Wellington. 1953.

The High Trail. By Elers Koch. Caxton Printers, Ltd., Caldwell, Idaho. 1953. $3.50.

Lodgepole Pine Bibliography. By David Tackle and D. I. Crossley. 57 pp. Intermountain Forest and Range Expt. Sta., Ogden, Utah. 1953. Research Paper No. 30. Mimeog.

Trees and Their Story. By Dorothy Sterling. 119 pp. Illus. by Myron Ehrenburg. Doubleday, New York 22. 1953. $2.50.

Forest Management

Forest Management Plan and Instructional Aids, Wausau Vocational School Forest, Wausau, Wisconsin. 35 pp. Illus. Trees for Tomorrow, Inc., Merrill, Wis. 1953.

Increasing the Efficiency of Airphoto Forest Surveys by Better Definition of Classes. By C. A. Bickford. 9 pp. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1953. Station Paper No. 58. Mimeog.

Forest Products

The Forest Industries of New York. By N. C. Brown. 14 pp. Empire State Forest Products Ass'n. 1954. Obtainable from the author, 122 Dorset Rd., Syracuse 10, N. Y. Mimeog.

Forest Industries of the Philippines. By W. L. Gooch. 160 pp. Illus. A Cooperative Project of the Bur. of Forestry . . . Philippine Council for U. S. Aid and the U. S. Mutual Security Agency, Manila. 1953.

Forest Products Research and Industries in the United States. By W. W. Varossieau. 726 pp. Illus. Meulenhoff & Co., Amsterdam, Holland. 1953. h fl. 45.

Production and Marketing of Wood Piling and Poles in the Northeast. By M. D. Ostrander. 23 pp. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1953. Station Paper No. 57.

Wood Industries Dictionary. Ed. by N. C. Brown. 42 pp. Wood & Wood Products, Vance Co., Chicago, Ill. 1953.

Forest Resources

Forest Statistics for Central Maryland. By W. G. Banks. 19 pp. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1953. Forest Statistics Ser: Maryland No. 2. Mimeog.

Forest Statistics for Mason County, Washington. By F. L. Moravets. 24 pp. Pacific Northwest Forest & Range Expt. Sta., Portland, Ore. 1953. Forest Surv. Report No. 110. Mimeog.

Industrial Possibilities of the Forest Resource of Kentucky. 53 pp. Agric. and Indus. Devel. Board of Kentucky, Frankfort. 1953. Mimeog.

Pathology

Aiding Blister Rust Control by Silvicultural Measures in the Western White Pine Type. By V. D. Moss and C. A. Wellner. 32 pp. U. S. Dept. of Agric., Washington 25, D. C. 1953. Cir. No. 919. 10 cents (Govt. Print. Off.).

Climate and Birch "Dieback." By L. S. Hawboldt. 37 pp. Nova Scotia Dept. of Lands and Forests. 1952. Bul. No. 6.

The Fungal Diseases of Sal (Shorea Robusta *Gaertn.*) *Pt. 1. Leaf Spot . . . Stem Canker . . . Sooty Moulds . . . Root and Stem Rot. . . .* By K. Bagchee. P. 11-23. Illus. Manager of Publications, Delhi. 1953. Indian Forest Records (Mycology) Vo. 1, No. 2 (n.s) Rs. 1/4/- or 2 sh.

Range Management

Ecological Effects of Planned Burning of Sagebrush-Grass Range on the Upper Snake River Plains. By J. P. Blaisdell. 39 pp. Illus. U. S. Supt. of Documents, Washington 25, D. C. U. S. Dept. of Agric. Tech. Bul. No. 1075. July 1953. 15 cents.

Estimating Utilization of Idaho Fescue (Festuca idahoensis) *on Cattle Range by Percent of Plants Grazed.* by R. M. Hurd and N. A. Kissinger. 5 pp. U. S. Forest Serv. Rocky Mtn. Forest & Range Expt. Sta., Ft. Collins, Colo. Sta. Paper No. 12. August 1953.

Forage Grasses for Hay and Pasture, Nos. 1-4. By J. H. Robertson and others. Nevada Agric. Expt. Sta., Reno. Mimeo. Cirs. 1-4. 1952-53.

Forage Utilization by Cattle on Northern Great Plains Ranges. By C. E. Holscher and E. J. Woolfolk. 27 pp. Illus. Supt. of Documents, U. S. Govt. Print. Off., Washington 25, D. C. U. S. Dept. Agric. Cir. No. 918. June 1953. 10 cents.

Range Sheep Production in Western Canada. By S. B. Slen and others. 48 pp. Illus. Canada Dept. of Agric., Ottawa. Pub. No. 886. March 1953.

Reseeding Desert Grassland Ranges in Southern Arizona. By D. Anderson and others. 32 pp. Illus. Ariz. Agric. Expt. Sta., Tucson. Bul. No. 249. July 1953.

Silviculture

Development of Vegetation on Century-Old Iron-Ore Spoil Banks. By E. H. Tyron and Rudolfo Markus. 63 pp. Illus. West Virginia Univ. Agric. Expt. Sta., Morgantown. 1953. Bul. No. 360.

Forest Regeneration in Ontario. By R. C. Hosie. 134 pp. Illus. Univ. of Toronto Press for The Research Council of Ontario. 1953. For. Bul. No. 2.

Growth and Development of Coniferous Plantations at Grand' Mère, P. Q. By G. C. Cunningham. 28 pp. Canada Dept. of Res. & Devel., Ottawa. 1953. Silv. Res., Note No. 103.

Mortality Estimation in Fully-Stocked Stands of Young-Growth Douglas-Fir. By G. R. Staebler. 8 pp. Pacific Northwest Forest & Range Expt. Sta., Portland, Ore. 1953. Research Paper No. 4.

Natural Regeneration of Loblolly Pine in the Southeastern Coastal Plain. By R. D. McCulley. 14 pp. Illus. Southeastern Forest Expt. Sta., Asheville, N. C. 1953. Station Paper No. 26.

Seed Maturity in White Spruce. By D. I. Crossley. 15 pp. Canada Dept. of Res. & Devel., Ottawa. 1953. Silv. Res. Note No. 104.

Soil Moisture and the Distribution of Lodgepole and Ponderosa Pine; A Review of the Literature. By R. F. Tarrant. 10 pp. Pacific Northwest Forest and Range Expt. Sta., Portland, Ore. 1953. Research Paper No. 8. Mimeog.

Wildlife Management

Some Winter Habits of White-Tailed Deer and the Development of Census Methods in the Flag Yard of Northern Wisconsin. By Cyril Kabat, N. E. Collias and R. C. Guettinger. 32 pp. Illus. Wisconsin Conserv. Dept., Madison 2. 1953. Tech. Wildlife Bul. No. 7.

Wood Technology and Utilization

Beech for Veneer and Plywood. By H. O. Fleischer. 24 pp. Illus. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1953. Beech Util. Ser. No. 6. Mimeog.

How Growth of White Pine Affects Its Properties for Matches. By M. Y. Pillow. 4 pp. Illus. U. S. Forest Products Lab., Madison, Wis. 1953. Report No. D1950. Mimeog.

Moisture Absorption in Certain Tropical American Woods. By M. R. Samborski, G. T. Tsoumis and F. F. Wangaard. 6 pp. Tables. Yale School of Forestry, New Haven. 1953. Properties of Tropical Woods Rept. No. 8 (rev.). Mimeog.

Timbers for House Building (Use Guide No. 1). By Gerald Hart. 51 pp. Timber Devel. Ass'n., Ltd., London E.C. 4.

The Wood Pallet Industry; Its Development and Progress Toward Standardization. 20 pp. Illus. U. S. Forest Products Lab., Madison, Wis. 1953. Rept. No. 1957. Mimeog.

Society Affairs

Officers and Members of the Council, 1954-1955

E. L. Demmon, *President*
Southeastern Forest Experiment Station
Federal Building
Asheville, N. C.

DeWitt Nelson, *Vice President*
Department of Natural Resources
State Building 1
Sacramento, Calif.

Henry Clepper, *Executive Secretary*
Mills Building, 17th Street at Pennsylvania Avenue, N. W.
Washington 6, D. C.

William J. Brown
Woodlands Department
Kimberly-Clark Corporation
Neenah, Wis.

Stanley G. Fontanna
School of Natural Resources
University of Michigan
Ann Arbor, Mich.

Joseph S. Illick
College of Forestry
State University of New York
Syracuse 10, N. Y.

C. Huxley Coulter
Florida Forest Service
Tallahassee, Fla.

Percy D. Hanson
U. S. Forest Service
Federal Building
Missoula, Mont.

J. Herbert Stone
U. S. Forest Service
Post Office Building
Portland 8, Ore.

D. B. Demeritt
Dead River Company
6 State Street
Bangor, Me.

Edwin F. Heacox
Weyerhaeuser Timber Company
Tacoma 1, Wash.

Ruthford H. Westveld
Department of Forestry
University of Missouri
Columbia, Mo.

FISCAL YEAR MEMBERSHIP CAMPAIGN

School Box Score

School	Student applications received: January listing	Student applications received: Total fiscal year 1954
Alabama Polytechnic Institute	0	0
University of California	4	14
Colorado A & M College	7	7
Duke University	0	0
University of Florida	4	12
University of Georgia	4	17
University of Idaho	2	2
Iowa State College	5	19
Louisiana State University	0	0
University of Maine	0	0
University of Massachusetts	5	13
Michigan State College	3	8
University of Michigan	5	5
University of Minnesota	7	7
University of Missouri	3	16
Montana State University	0	0
State University of New York	2	8
North Carolina State College	0	0
Oregon State College	4	6
Pennsylvania State College	4	6
Purdue University	0	17
Utah State Agricultural College	2	2
University of Washington	7	10
West Virginia University	1	6
Yale University	0	0
Totals	69	175

FISCAL YEAR MEMBERSHIP CAMPAIGN

Section Box Score

Section	Proposed 1954 quota	Applications received[1]: January listing	Applications received[1]: Total fiscal year
Allegheny	100	9	14
Appalachian	100	0	3
Central Rocky Mountain	45	8	8
Central States	110	9	31
Columbia River	140	7	11
Gulf States	105	5	6
Inland Empire	30	2	2
Intermountain	30	2	2
Kentucky-Tennessee	30	0	0
New England	95	5	15
New York	65	2	10
Northern California	120	8	19
Northern Rocky Mountain	30	2	3
Ozark	55	4	18
Puget Sound	80	8	12
Southeastern	145	12	41
Southern California	20	0	0
Southwestern	35	0	0
Upper Mississippi Valley	60	13	27
Washington	45	3	3
Wisconsin-Upper Michigan	60	0	0
Totals	1,500	99	225

[1]Student, Junior, Affiliate, Associate (initial) grades only.

Coming Events

New York Section

The New York Section winter meeting will be held Jan. 28-29 at the New York State College for Teachers in Albany.

Southeastern Section Annual Meeting

The annual meeting of the Southeastern Section, S.A.F., will be held in Thomasville, Ga., Jan. 29 and 30. Meeting headquarters will be the Hotel Scott.

Upper Mississippi Valley Section

The Upper Mississippi Valley Section will hold its winter meeting in St. Paul, Minn. Feb. 12-13.

Allegheny Section

The Allegheny Section will hold its winter meeting in Baltimore, Feb. 25-27.

North American Wildlife Conference

The 19th North American Wildlife Conference will be held in the Palmer House, Chicago, March 8-10.

New England Section

The New England Section will hold its winter meeting at the Hotel Somerset, Boston, March 11-12.

Forest Products Research Society

The 1954 meeting of the Forest Products Research Society will be held in Grand Rapids, Mich., May 5, 6, and 7, under the direction of Fred E. Dickenson, national meeting chairman.

Gulf States Section

The Gulf States Section will hold its spring meeting at Lake Charles, La., May 6-7.

Dues Deductible

In filing U. S. income tax reports, all members may classify dues paid and contributions made to the Society of American Foresters as deductible expenses.

Dues for 1954 should be paid promptly and in no case should they remain unpaid after June 30, 1954. Members whose dues are not paid by that date will receive no further issues of the JOURNAL OF FORESTRY until dues are paid.

Read the report of the biennial election of S.A.F. Officers and Council, page 3

Philip C. Wakeley Becomes Journal Associate Editor

Philip C. Wakeley, assistant silviculturalist in the Southern Forest Experiment Station, has been named associate editor for Forest Genetics and Artificial Regeneration for the JOURNAL OF FORESTRY, the appointment to become effective with this issue. Up to the present time Dr. Carl E. Ostrom, associate editor for Silviculture, has been reviewing genetics articles in addition to his work with the great number of manuscripts received in his field.

Mr. Wakeley's appointment is the result of Council action at the recent annual meeting in Colorado Springs, taken because of an increasing number of articles on forest genetics received by the JOURNAL during the past year, and the feeling that this important field should be more fully covered in

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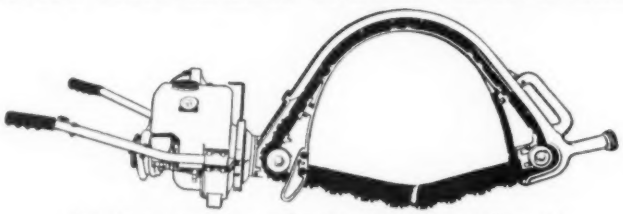

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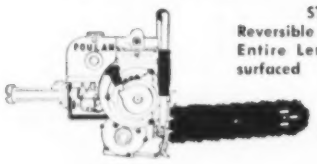

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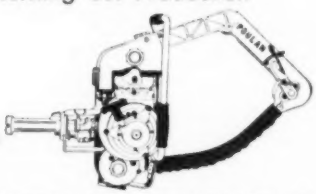

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the JOURNAL. In addition, the Northeastern Forest Research Advisory Council, meeting in August, requested that the Society authorize the addition of such an associate editor to the staff.

To further point up growing interest in the field of forest genetics, the JOURNAL plans to devote an entire issue to the subject in 1954.

Mr. Wakeley has done research work at the Southern Forest Experiment Station since 1924, principally in the fields of forestation, mensuration, natural reproduction, with some work in the fields of entomology and pathology. He received his B.S. degree at Cornell in 1923. He has been a member of the S.A.F. since 1926.

Brockman Resigns Assoc. Editorship

Prof. C. Frank Brockman, U. of Calif. College of Forestry, has resigned his position as associate editor for Forest Recreation on the editorial board of the JOURNAL effective with this issue.

Prof. Brockman has served energetically and most capably in this capacity since 1946 and the JOURNAL extends him thanks for his contributed effort on behalf of the Society in general. Prof. Brockman felt it necessary to relinquish the assignment on the basis of length of service and other duties.

For the time being at least, Dr. Lee E. Yeager, associate editor for Forest-Wildlife Management, will combine editorship for recreational subjects with his present assignment.

Kentucky-Tennessee Section Holds Annual Meeting

The annual meeting of the Kentucky-Tennessee Section was held Nov. 13 and 14, 1953 at Gatlinburg, Tenn. Theme of the program was "Forestry on Public Lands."

At the morning session on Nov. 13 the participants, representing state organizations, discussed state forest management, game management, extension and education. G. B. Buller served as program chairman. The afternoon session, Charles Cheston, chairman, was concerned with the management of federal lands. At least 12 speakers participated on these two sessions.

At the Section's annual banquet on the evening of Nov. 13, John N. Tyler served as toastmaster. The after dinner speaker was W. H. Horning of the Bureau of Land Management, U. S. Department of the Interior.

A business meeting was held on the morning of Nov. 14. Chairman Kenneth Seigworth presided. Reports of Section committees and officers were presented as follows:

Secretary, John W. Lehman.
Membership, Paul B. Davis.
News Bulletin, A. M. Williams.
Oak Wilt, Russell Stadelman.
Corporate Land Ownership, Richard Kilbourne.
Journalism Award, John B. Sharp.
Legislation, Paul A. Yost.

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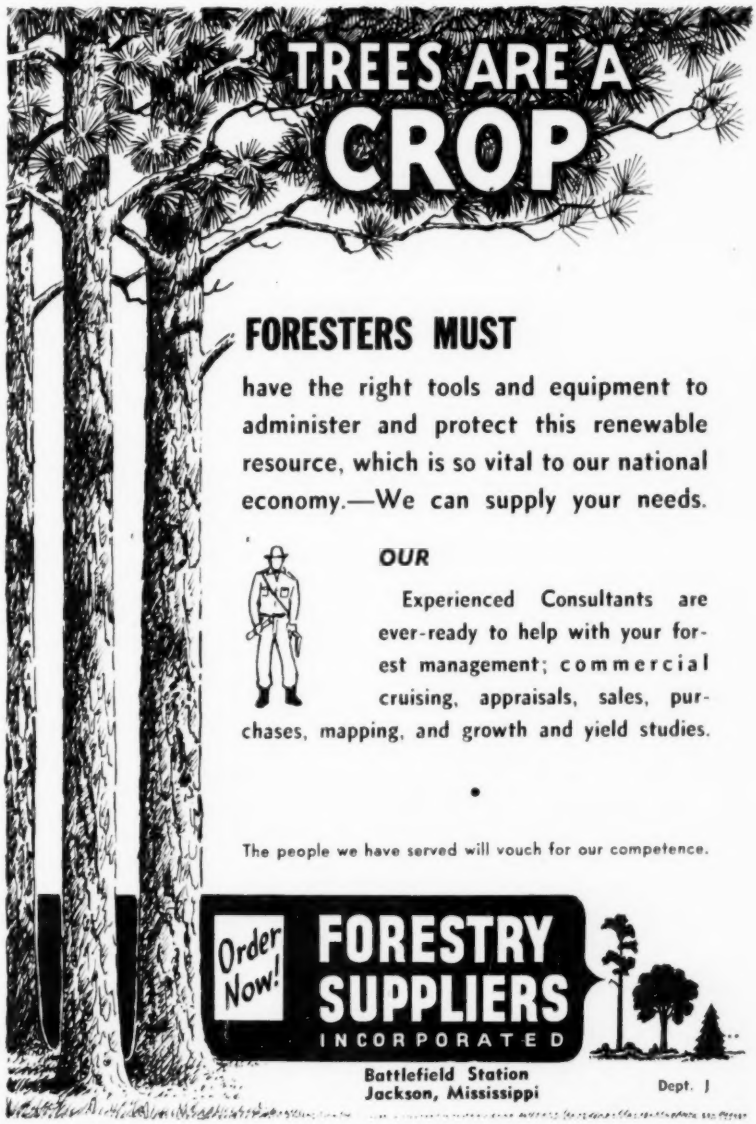
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Licensing, Charles R. Page.

Junior Writing Awards, J. O. Artman.

E. L. Demmon, vice president, and Henry Clepper, executive secretary, discussed national Society affairs.

By unanimous vote of the members present, the Section officially invited the Council to hold the 1956 annual meeting of the Society in Memphis during the period Oct. 14-17.

Charles R. Page was installed as the new vice chairman.

James A. Newman was appointed editor of the Section news bulletin.

New York Section Annual Winter Meeting

The New York Section winter meeting will be held in Albany at the New York State College for Teachers, Jan. 28 and 29, 1954. The theme of the meeting is to be "Utilization of Small Hardwoods." Speakers from the State College of Agriculture Extension Service, U. S. Forest Service, College of Forestry, and Forest Products Industries will appear on the program.

Section members will meet for their annual banquet on the evening of Jan. 28. Dr. John Farrell, who is a Section member, will present an illustrated talk on "Life on our Pacific Gibraltar—Okinawa, 1953." Dr. Farrell has recently returned from Okinawa where he served in a military capacity.

The business session of the Section will take place on the morning of Jan. 29, at which time the biennial election of officers will take place.

The following letter has been received by the S.A.F. from Florencio Tamesis, Director of Forestry for the Philippine Islands:

October 5, 1953

Mr. Geo. L. Drake, President
Society of American Foresters
Mills Building, Washington, D. C.

Dear Mr. Drake:

Your letter of September 29, 1953 was received this morning, and I am certainly grateful to you and your Council for the honor accorded me on my election as Honorary Member of the Society of American Foresters. Indeed this is very significant for it is a recognition of the humble part that we here in the Philippines are doing for forestry.

Again thanking you and the Council for my election, I remain

Ever sincerely yours,
/s/ FLORENCIO TAMESIS
(Director of Forestry)

Election of Fellows

Fellows of the Society (who are the electors of new Fellows) are being importuned by various members of the S.A.F. to vote to admit their favorite candidate to this highest grade of membership. If the friends of one candidate are writing in his behalf, the friends of all the candidates should. Then each Fellow would get electioneering letters in every mail for a month or more, and the scrambie to promote certain popular sons would degerenate to the level of an election of aldermen.

Candidates for the grade of Fellow are expected to be "foresters of outstanding achievement" such that their "record and reputation should be well known among Members and Fellows." The ballot which goes to the 62 living Fellows (plus 10 Council members) carries a 200 word factual biography which is enough to guide the vote of the electors.

I must confess that when I get two glowing appeals to vote for a candidate I find difficulty in avoiding prejudice by comparison with an equally outstanding candidate whose friends have not tried to force his election. The propriety of having section officers electioneer over their S.A.F. title, for a candidate I think is questionable, and to my notion would detract from the honor which an unsought and unhigh-pressured election would bring.

THORTON T. MUNGER
Fellow (1946).

October 29, 1953

Membership Applications and Advancements

Proposals for admission, advancement, and reinstatement received in the Society office during the month of November are listed below.

Action on the eligibility of those proposed for membership as listed below will be taken by the Council as of February 1, 1954. Communications from voting members regarding the membership eligibility of these persons should be received in the Society office prior to that date.

Allegheny Section

Student Grade

PENNSYLVANIA STATE COLLEGE

Bergey, G. A.
Clepper, A. L.
Dyke, S. H.
Johnson, D. W.

WEST VIRGINIA UNIVERSITY

Nicely, P. D.

Junior Grade

Korth, W. R., CFM Forester, Del. State Forestry Dept., Dover, Del.; Pa. State, B.S.F., 1953.

Shattuck, R. D., Cons. Forester, Titusville, Pa.; Pa. State, B.S.F., 1949

Affiliate Grade

Huber, A J., Forester, N. J. Dist. Water Supply Comm., Wanaque, N. J.; Pa. State Forest School, (Forestry), 2 yrs.

Associate Grade

Yuill, J. S., Ento., Forest Insect Lab., U.S. D.A., Beltsville, Md.; Univ. of Ariz., B.S., (Agric.), 1929; Univ. of Calif., M.S., (Ento.), 1935.

Central Rocky Mountain Section

Student Grade

COLORADO A & M COLLEGE

Barrett, J. R. — Taylor, W. E.
Johanson, E. G. — Waltz, B. L.
Mulvaney, R. J. — Wittmeyer, J. G.
Reichle, R. E.

Junior Grade

Lake, R. M., Forester, U.S.F.S., Deadwood, S. Dak.; Mont. State Univ., B.S.F., 1953.

Central States Section

Student Grade

MICHIGAN STATE COLLEGE

Friend, R. A. — Neal, J. E.
Marlega, R. R.

UNIVERSITY OF MICHIGAN

Blankenship, C. A. — Young, J. L.
Carson, H. B. — Zandersons, O. G.
Pfeiffer, L. C.

Affiliate Grade

Irvine, G. W., Game Mgmt. Supv., Ohio Div. of Wildlife, Columbus, Ohio; Mich. State, B.S., (Forestry), 1951.

Columbia River Section

Student Grade

OREGON STATE COLLEGE

Drain, J. C. — Heuschkel, D. G.
Ellson, A. C. — Patchen, G. N.

Junior Grade

Cruickshank, E. D., Forester, U.S.F.S., Corvallis, Ore.; State Univ. of N. Y., B.S.F., 1953.

Jones, E. E., Forester, U.S.F.S., Parkdale, Ore.; Ore. State College, B.S.F., 1938.

Stratton, C. H., Branch Mgr., Western Fire Equip. Co., Portland, Ore.; Ore. State College, B.S.F., 1947. Reinstatement.

Member Grade

Berry, D. W., Research Dir., Ore. State Board of Forestry, Salem, Ore.; Ore. State College, B.S.F., 1941. (Junior, 43R53).

Affiliate Grade

Rich, J. P., Log Scaler, S. Oregon Log Scaling & Grading Bureau, Roseburg, Ore

Gulf States Section

Junior Grade

Davis, B. H., Forester, Woodard-Walker Lbr. Co., Taylor, La.; L.P.I., B.S., (Forestry), 1949. (Affiliate, 1951).

Freeman, J. E., Forester, Frost Lbr. Ind., Nacogdoches, Texas; L.P.I., B.S., (Forestry), 1949. (Affiliate, 1951).

Kuprionis, J., Asso. Prof., Silvic., L.P.I., Ruston, La.; Agric. Academy of Lithuania, B.S.F., 1930; Mich. State, M.F., 1950.

Luzader, J. L., Cons. Forester's Asst., Int. Paper Co., DeRidder, La.; L.P.I., B.S., (Forestry), 1951. (Affiliate, 1951).

Member Grade

King, D. B., Southern Forest Exp. Sta., Oxford, Miss.; Univ. of Minn., B.S.F., 1938. (Junior, 1947).

May, W. W., Forester, Ill. Central R.R., Jackson, Miss.; Univ. of Mich., B.S.F., 1941; M.F., 1947. (Junior, 1948).

Thorsen, D. W., Dist. Rgr., U.S.F.S., Forest, Miss.; Univ. of Minn., B.S.F., 1936. (Junior, 1948).

Affiliate Grade

Estes, J. H., Forest Tech., Int. Paper Co., Walnut Grove, Miss.

Holifield, J. W., Forest Tech., Int. Paper Co., Canton, Miss.

Peppers, L. W., Forester, Davis Brothers Lbr. Co., Ansley, La.; L.P.I., B.S. (Forestry), 1953.

Phillips, H. C., Forest Tech., Int. Paper Co., Canton, Miss.

Inland Empire Section

Student Grade

UNIVERSITY OF IDAHO

Finch, S. J. — Brookwell, W. T.

Intermountain Section

Student Grade

UTAH STATE AGRICULTURAL COLLEGE

Bills, J. E. — Irby, C. H.

New England Section

Student Grade

UNIVERSITY OF MASSACHUSETTS

Curtis, J. R. — Ripley, W.
Knapp, H. A. — Weston, K. G.
Putman, R. D.

Member Grade

Winer, H. I., Instr., Yale School of Forestry, New Haven, Conn.; Yale Univ., M.F., 1949. (Junior, 1949).

New York Section

Student Grade

STATE UNIVERSITY OF NEW YORK

Fritch, D. R. — Sears, G.

Northern California Section

Student Grade

UNIVERSITY OF CALIFORNIA

Bedow, R. J. — Hoerr, R. C.
Harris, A. S. — Peakes, W. C.

Junior Grade

Carey, R. R., Asso. State Forest Rgr., Calif. State Div. of Forestry, Sacramento, Calif.; Utah State Agric. College, B.S.F., 1941.

Davis, F. R., Teacher, Fortuna Union High School, Fortuna, Calif.; Univ. of Calif., B.S.F., 1949; M.F., 1953.

Harris, J. G., Foreman, Calif. Div. of Forestry, Red Bluff, Calif.; Univ. of Idaho; B.S.F., 1951.

Higgins, R. R., Forest Fire Prevention Officer, Calif. Div. of Forestry, Sacramento, Calif. (Affiliate, 1951).

Hooker, G. B., Logging Engr., Mill Creek Logging Co., Smith River, Calif.; L.P.I., B.S., (Forestry), 1951. (Affiliate, 1951).

Member Grade

Belfils, N. A., Forester, Loveness Logging Co., Canby, Calif.; Oregon State, B.S.F., 1943. (Junior, 1946).

Bennett, D. L., Asso. State Rgr., Calif. Div. of Forestry, Auburn, Calif.; Univ. of Calif., B.S.F., 1947. (Junior, 1949).

Burton, R. E., Councilman, Santa Cruz, Calif.; Univ. of Calif., B.S.F., 1915. (Junior, 1942).

Gellermann, D., Forester, Glenco Forest Products, Sacramento, Calif.; Univ. of Wash., B.S.F., 1939. (Junior, 1945).

Associate Grade

Downing, G. L., Ento., Forest Insect Lab., U.S.D.A., Berkeley, Calif.; Oregon State, B.S., (Ento.), 1951.

Northern Rocky Mountain Section

Junior Grade

Davidson, R. W., Salesman, Yaw-Kinney Co., Inc., Great Falls, Mont.; Mont. State Univ., B.S.F., 1948.

Leader, R. J., 11 Chouteau, Missoula, Mont.; Univ. of Ariz., B.S., (Ecology), 1951; Mont. State Univ., M.S.F., 1953. (Student, 1953).

Saltsman, D. W., J. Neil's Lbr. Co., Rexford, Mont.; Mont. State Univ., B.S.F., 1953. (Student, 1952).

Wright, G. G., Grad. Student, Mont. State Univ., Missoula, Mont., Mont. State Univ., B.S.F., 1953.

Ozark Section

Student Grade

UNIVERSITY OF MISSOURI

Allen, J. G. — Massengale, R. A.
Breeding, L. E.

Junior Grade

Kmecza, N. S., Dist. Rgr., U.S.F.S., Glenwood, Ark.; Purdue Univ., B.S.F., 1939.

Ruffin, W. C., Mgmt. Asst., Ark. State Forestry Comm., Pine Bluff, Ark.; L.P.I., B.S., (Forestry), 1951. (Affiliate, 1952).

Puget Sound Section

Student Grade

UNIVERSITY OF WASHINGTON

Heinrich, S. L. — Villager, H. A.
Nilson, A. E. — Ward, W. B.
Nunan, P. A. — Willrich, C. A.
Petrone, E. A.

Junior Grade

Mills, R. F., Resident Engr., Canadian Forest Products, Englewood, B.C., Canada; Univ. of Wash., B.S.F., 1950.

Southeastern Section

Student Grade

UNIVERSITY OF FLORIDA

Brown, P. A. — Holmes, C. W.
Coleman, W. J. — Pittman, R. E.

UNIVERSITY OF GEORGIA

Richards, H. C. — Dennis, A. C.
Rogers, W. G. — Elliott, M. C.

Junior Grade

Dobberstein, R. A., Dist. Forester, N. Georgia Timberland Co., Rome, Georgia, Newnan, Georgia; Univ. of Mich., B.S.F., 1952; M.F., 1952.

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Name .....

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Greenwalt, V. A., Forester, U.S.F.S., Grayson, Ala.; Univ. of Mich., B.S.F., 1950; M.F., 1952.

Associate Grade

Duffee, Cecil G., President, Dadeville Lbr. Co., Inc., Dadeville, Ala.

Affiliate Grade

Parsons, E. A., Forestry Aide, U.S.F.S., Gainesville, Ga.

Upper Mississippi Valley Section

Student Grade

IOWA STATE COLLEGE

Berlyn, G. P.
Homan, K. A.
Lamansky, W. H.
MacPeak, M. D.
Ploen, D. L.

UNIVERSITY OF MINNESOTA

Anderson, N. C.
Froelich, R.
Koenigs, J.
Lathrop, W. E.
Schramek, R.
Sheppard, J. E.
Ystesund, K. A.

Junior Grade

Crowther, C. R., Grad. Student, Iowa State College, Ames, Iowa; Iowa State, B.S.F., 1947. Reinstatement.

Kennedy, R. J., Forester, Minn. Forest Service, Hill City, Minn.; Univ. of Minn., B.S.F., 1951.

Washington Section

Junior Grade

Moore, F. A., Cartographic Aide, U.S.D.I., Washington, D. C.; Pa. State College, B.S.F., 1951.

Affiliate Grade

Harbison, J. S., Staff Asst., Office of the Chief of Civil Affairs & Military Government, Washington, D. C.

Associate Grade

Boyd, H. C., Reference Librarian, U.S.D.A., Library, Washington, D. C.; Univ. of Texas, B.A., (Literary), 1926; Our Lady of the Lake College, B.S.L.S., 1935.

Fred P. Struhsaker (1904-1953)

Fred P. Struhsaker, secretary of the Michigan Conservation Commission, Lansing, died Nov. 17, 1953.

A native of Waterville, Ohio, and a graduate in forestry (1928) of the University of Michigan, he joined the Michigan Department of Conservation the following year, becoming chief of the Lands Division in 1934.

In this office he occupied a key position in the formulation of land policy for the state. This division handles transactions involving the 4½ million acres controlled by the department, and conducts classification surveys of land used for forest and game management.

Recognized as one of the outstanding foresters in the state, Mr. Struhsaker served as chairman of the Forestry Section of the Michigan Academy of Science, Arts, and Letters.

Division of Range Management Announces New Officers

The following officers of the Division of Range Management were elected at the Division's meeting in Colorado Springs: chairman, M. W. Talbot; vice chairman, Charles E. Poulton; and secretary, Bert H. Tucker.

Advertising Rates Increased for Journal of Forestry

Effective January 1, 1954, advertising rates for the JOURNAL OF FORESTRY were increased 25 percent. In 1930 the page rate was $50; in 1939, $100; and in 1952 the rate was increased to $120. On January 1 the rate was advanced to $150 per page.

For some time an adjustment in advertising rates had been indicated because of the rapid rise in the circulation of the JOURNAL OF FORESTRY and the expanded coverage of the field of forestry. As the only technical forestry magazine published in the United

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States and a recognized leader in its field throughout the world, the JOURNAL OF FORESTRY offers to potential advertisers a direct approach to a forestry market expending millions of dollars annually. Society members are requested to recommend the JOURNAL OF FORESTRY as an advertising medium to manufacturers of forestry equipment, supplies, and tools. If needed, rate cards and advertising brochures are available from the Society office.

Key on Journal of Forestry Envelope

Perhaps few members notice the stencilled key number appearing with their name and address on the envelope which they receive monthly containing the JOURNAL OF FORESTRY. It's an important marking because it gives a member the history of his Society membership. Moreover, provided he resides where the Section boundaries divide a state, his Section affiliation is indicated on his mailing stencil. An example is the State of California, divided between the Northern California Section and the Southern California Section. Members residing in northern California will note on their stencilled address the letters "NC" indicating their Section affiliation. Where the territory of a Section is confined within state boundaries—such as the Southwestern Section, including only the states of Arizona and New Mexico —no Section affiliation is shown.

This key is especially helpful to Sections and their membership committees, particularly in reviewing the Section cards (on which every member's key appears) sent them semi-annually of those members eligible for advancement in grade.

Numbers and letters are used in the key to indicate the year of initial election, grade of membership, and date of advancement. As an aid in interpreting the key an explanation and examples follow.

In the case of a Student Member (who must be enrolled in the junior or senior class), his stencilled key number shows date of election and class in which he is enrolled. Example: STJ51 (or STS51) as the case may be. When graduated and advanced to the grade of Junior Member his key becomes 52, indicating year of advancement. When advanced to the grade of Member his key becomes 52M58.

The key numbers of members elected direct to the Junior grade (without passing through the grade of Student Member) are shown simply by the year—40, 41, 42—and when advanced their keys read 40M46, 41M47, 42M48. If dropped for nonpayment or resigned and later reinstated their keys show the dates of initial election and reinstatement. Thus—40M46R51, 41M47-R52, 42MR53.

Members elected to Affiliate and Associate grades of membership are also identified by year and grade. Thus—Af40 (Affiliate); A40 (Associate). In those cases where Affiliate Members are advanced the key would read Af40J46.

By the use of this key stencilled on the mailing envelope of the JOURNAL OF FORESTRY and cards sent to the Sections, the history of any member can be easily read.

New Forest Conservation Society Organized

At a gathering in the home of Mrs. Gifford Pinchot in Washington, D. C., on November 30, a group of conservationists and foresters agreed to found the new Forest Conservation Society of America. In her introductory remarks, Mrs. Pinchot expressed the opinion "that many conservationists have been feeling that something is needed today in order to revive the crusading spirit of the early days."

In the discussion which followed, frequent assertion was made "that no conservation group in the forestry field stood ready to meet the challenge of the lumber and cattle interests seeking to control the national forests." A majority of those present felt that a new forestry society founded primarily to represent the public interest was needed to bring together all groups interested in what Pinchot said was the essence of conservation: "The greatest good to the greatest number over the longest period of time."

The group discussed a series of principles "designed both to prevent further forest exploitation on private lands, but also to extend and promote action by public agencies in the conservation field."

A committee designated to lay the groundwork for formally establishing The Forest Conservation Society consists of Ira N. Gabrielson, Mrs. Gifford Pinchot, Charles E. Brannan, Earle Clapp, Raymond E. Marsh, Anthony W. Smith, Stephen Raushenbush, and Charles H. Stoddard.

Consulting Foresters

Approved for Listing on January 1, 1954, by the
SOCIETY OF AMERICAN FORESTERS

The following List of Consulting Foresters is published by the Society of American Foresters for the information of prospective clients.

Individuals listed are members of the Society of American Foresters and as such are believed qualified and competent to perform the technical services specified. However, the Society cannot assume responsibility for the actions of individuals or firms listed.

Permission to publish or reproduce this list in whole or in part, but without unauthorized additions, is hereby granted. Revised lists will be issued annually.

Code of Fields of Specialization

1. Arboriculture and tree preservation.
2. Cost and economic studies of forest operations.
3. Forest and wood utilization.
4. Forest management and silvicultural practice.
5. Forest protection from disease.
6. Forest protection from fire.
7. Forest protection from insects.
8. Forest taxation.
9. Game and wildlife management.
10. Logging engineering.
11. Market studies and trade promotion (forest products).
12. Naval stores operations.
13. Pulpwood operations.
14. Range management.
15. Surveying and mapping.
16. Timber valuation and appraisal.
17. Timber volume and quality estimates.
18. Tree planting and reforestation; reproduction studies.
19. Wood preservation.
20. Wood seasoning.
21. Wood technology.

Raymond D. Adolph, 44 Roe Park, Highland Falls, New York.
Territory: Southeastern New York.
Specialization: 4, 5, 6, 7, 18.

Ernest E. Ahler, Consulting Forester, Route 2, Bishop Road, Knoxville, Tennessee.
Territory: Southeast.
Specialization: 2, 3, 4, 6, 13, 16, 17, 18. Also preparation, negotiation or advertisement, and administration of timber sales for large and small timber landowners, and boundary line establishment.

Thos. W. Alexander, Consulting Forester, Waynesville, North Carolina.
Territory: South, Central States, and Appalachians.
Specialization: 2, 4, 11, 16, 17.

John R. Allison, 483 W. Palmetto Street, Florence, South Carolina.
Territory: Eastern South Carolina.
Specialization: 3, 4, 6, 7, 13, 16, 17, 18.

Glenn O. Antonie, Consulting Forester, Box 134, Linden, Alabama.
Territory: Alabama, Mississippi.
Specialization: 2, 3, 4, 5, 6, 7, 8, 12, 13, 15, 16, 17, 18. Also agent for absentee timber owners; timber sales and cutting supervision; forest litigation.

Milton Applefield, Consulting Forester, 317 Edgewood Circle, Conway, South Carolina.
Territory: South coastal plain.
Specialization: 3, 4, 10, 13, 15, 16, 17, 18. Also sawmill efficiency studies; litigation and damage claims.

S. Gayley Atkinson, Consulting Forester, Huntingdon Road, Huntingdon Valley, Pennsylvania.
Territory: Pennsylvania.
Specialization: 1, 18.

Henry L. Bango, Consulting Forester, P.O. Box 4072, Shreveport, Louisiana.
Consultant: Frank Gaensehals.
Territory: Northern Louisiana.
Specilization: 3, 4, 5, 16, 17, 18. Also purchase and sale of timbered properties.

George Banzhaf & Company, 662 North Water St., Milwaukee 2, Wisconsin.
Territory: Not Limited.
Specialization: 2, 3, 4, 8, 11, 13, 15, 16, 17.

W. R. Barnhill, Route 5, Slappey Drive, Albany, Georgia.
Territory: Southeastern U. S.
Specialization: 4, 17, 18. Also forest damage investigations.

Belanger and Bourget, Land Surveyors and Forest Engineers, 86 Cote de la Montagne, Quebec, Canada.
Consultant: M.-Albert Bourget.
Territory: Canada, especial Quebec.
Specialization: 2, 3, 4, 10, 11, 13, 15, 16, 17, 19, 20, 21. Also boundary lines.

Frank W. Bennett & Associates, Consulting Foresters, 1216 Louisiana National Bank Bldg., Baton Rouge, Louisiana. (Field Hdqrs. at Norwood, La.)
Consultants: Frank W. Bennett, W. C. Snyder.
Territory: Southern U. S.
Specialization: 3, 4, 6, 10, 11, 16, 17, 18. Retained as consultants by medium size landowners (300 to 20,000 acres). Manage all forest land resources, including timber, grazing, wildlife, minerals, etc.

Bigley and Feiss, Foresters, Inc., 767 Blair Blvd., Eugene, Oregon.
Consultants: Sherman Feiss, John Venator.
Territory: Washington, Oregon, California.
Specialization: 2, 3, 4, 6, 15, 16. Also sustained yield plans, supervision of contract logging, and timberland sales.

John C. Billingsley, Forest Consultant, 924 Fair Street, Newberry, South Carolina.
Territory: South Carolina and Georgia.
Specialization: 3, 4, 6, 9, 10, 15, 16, 17, 18.

Bishop Brothers, Consulting Foresters, Marion, South Carolina.
Consultant: H. F. Bishop.
Territory: South Carolina and southeastern U. S.
Specialization: 3, 4, 6, 8, 10, 13, 15, 16, 17, 18.

L. L. Bishop, Forest Consultant, 7034 Airline, Houston 9, Texas.
Territory: East Texas.
Specialization: 4, 6, 16, 18.

Lewis M. Boice, Consulting Forester, Orangeburg, South Carolina.
Territory: Within 100 miles of Orangeburg.
Specialization: 4, 6, 15, 16, 17.

Gordon Bowker, Consulting Forester, Registered Land Surveyor, % J. W. Lyle, Richburg, South Carolina.
Territory: Eastern U. S.
Specialization: 4, 9, 15, 16, 17, 20. Advice on plantation management.

Robert K. Boydell, 810 West Pine St., Hattiesburg, Mississippi.
Territory: Mississippi, Alabama, Louisiana.
Specialization: 2, 3, 4, 12, 13, 16, 17, 18. Also forest mapping from aerial photographs, and growth studies.

William J. Bozett, Consulting Forester, Logan, Ohio.
Territory: Ohio, Northern Kentucky, Pennsylvania, and West Virginia.
Specialization: Timber, Management and Marketing.

Allen W. Bratton, Consulting Forester, Shelterwood, Cooperstown, New York.
Territory: Northeast.
Specialization: 4, 5, 6, 7, 8, 11, 15, 16, 17, 18.

Brown and Brown, Forest Engineers, 614 Lewis Building, Portland 4, Oregon.

Consultants: Eugene R. Walsh (S.A.F. Associate Member), Samuel Rotschy.
Territory: Pacific coast.
Specialization: 2, 3, 4, 6, 8, 10, 11, 12, 15, 16, 17, 18.

Nelson C. Brown, Consulting Forester, 122 Dorset Road, Syracuse 10, New York. During summers, Milford, Pa.
Territory: Northeast.
Specialization: 2, 3, 8, 10, 11, 13, 16, 17.

Paul E. Bruns, 119 Mount Avenue, Missoula, Montana.
Territory: Not limited.
Specialization: 2, 4, 8, 11, 16, 17.

Charles H. Bunting, Timber Cruiser, 2455 Placer St., Redding, California.
Territory: California.
Specialization: 2, 10, 15, 16, 17.

California Foresteering, 429 Main Street, Placerville, California.
Consultant: Wm. B. Berry.
Territory: California pine region.
Specialization: 2, 3, 4, 10, 16. New solutions to the old problems of logging, milling, and timber management.

N. D. Canterbury, Consulting Forester, 4214 St. Emanuel Street, Apt. 3, Houston 4, Texas.
Territory: Texas and southeastern U. S.

Dudley C. Carey, 116 Fairmeade Road, Louisville 7, Kentucky.
Territory: Not limited.
Specialization: Forest and wood utilization, wood preservation, wood seasoning, wood technology. Also planning for wood conversion operations.

Carl M. Carpenter, Consulting Forester, Nashville, Indiana.
Territory: Indiana.
Specialization: 2, 4, 5, 6, 15, 16, 17, 18.

C. Dana Chalfant, R. D. No. 2, Gibsonia, Pennsylvania.
Territory: Central and western Pennsylvania, eastern Ohio, northern West Virginia.
Specialization: 4, 6, 9, 16, 18.

J. Wayne (Pete) Chalfant, 3135 Sussex Road, Raleigh, North Carolina.
Territory: North Carolina, South Carolina, Virginia.
Specialization: 1, 2, 3, 4, 6, 8, 10, 11, 13, 15, 16, 17, 18. Also licensed land surveyor North Carolina.

Edward J. Clancy, 1916 Sylvan Road, S.W., Atlanta, Georgia.
Territory: Northern Georgia and adjoining states.
Specialization: 4, 15, 16, 17. Also agent for timber owners.

Floyd F. Clark, Consulting Forester, Sky Ranch, Box 756, Ocala, Florida.
Territory: Southeast.
Specialization: 2, 3, 4, 6, 8, 9, 12, 13, 14, 15, 16, 17, 18. Also sale of timber properties; combined timber—cattle operations in the Southeast; insurance company representation for timber and range land.

John D. Coffman, 286 Lenox Ave., Oakland 10, California.
Territory: Principally California.
Specialization: 5, 6, 7, 16. Also forest and park recreational management.

T. S. Coile, Consulting Forester and Soil Scientist, Duke University, Durham, North Carolina.
Territory: Virginia to Texas; northern Rockies; Pacific Northwest.
Specialization: 4, 15, 16, 17, 18. Also determination of productive capacity of land for forest crops; soil evaluation; and land management.

Connwood, Inc., South Main Street, Cheshire, Connecticut.
Consultants: Ralph C. Hawley, Michael M. Pochan, Jr., Sherman H. Perkins.
Territory: Connecticut and adjacent areas.
Specialization: 3, 4, 10, 11, 13, 15, 17, 18, 19, 21.

Consulting Foresters, 4970 Kingsley Drive, Indianapolis, Indiana.
Consultants: Robert F. Davis, D. K. Goodwin.
Territory: Indiana.
Specialization: 4, 10, 11, 16, 17, 18.

David B. Cook, Consulting Forester, 12 McPherson Terrace, Albany 6, New York.
Territory: Eastern New York.
Specialization: Planted larch.

Philip T. Coolidge, Consulting Forester, 31 Central Street, Bangor, Maine.
Territory: Not limited.
Specialization: 2, 4, 8, 10, 13, 15, 16, 17, 18. Also farm appraisal.

William T. Cox, Consulting Forester and Biologist, 2186 Doswell Avenue, St. Paul 8, Minnesota.
Territory: General.
Specialization: Appraisals of forest properties; development of furbearers and other wildlife; selection of new locations for woodworking plants.

Keith Cranston & Associates, Leland, Mississippi.
Consultant: Keith Cranston.
Territory: Mississippi River Delta, and entire Gulf States Hardwood Bottomlands and Pine Types from Tennessee-Kentucky south.
Specialization: Bottomland Hardwood management, and supplemental commercial cruising. Retained in consultant capacity by firms operating in the South, and as Consultant-Manager for private landowners of bottomland hardwood and pine tracts.

C. P. Cronk, 10 Crown Ridge Road, Wellesley, Massachusetts.
Territory: Not limited.
Specialization: Studies in industrial forestry, with particular reference to problems in utilization, production, merchandising, and public relations.

Lucas M. Dargan, Consulting Forester, P. O. Box 167, Darlington, South Carolina.
Territory: Coastal Carolinas.
Specialization: 4, 9, 16, 17, 18. Also forest mapping and timber location studies from aerial photographs.

Randle J. Dedeaux, Consulting Forester, P. O. Box 52, Perkinson, Mississippi.
Consultant: Jed P. O'Neal.
Territory: Southern Mississippi; longleaf and slash pine types.
Specialization: 4, 13, 15, 17. Also growth studies, timber marking and marketing, and agent for absentee timberland owners.

Deep South Consulting Foresters, P. O. Box 580, 1407 Sixth Street, Tuscaloosa, Alabama. C. H. Schaeffer, Chief Forester.
Territory: Southeastern United States.
Specialization: 1, 4, 5, 6, 7, 10, 16, 17, 18. Also property management, litigation and damage appraisals, and claims for individuals, companies, and trust officers.

W. T. Doherty, Consulting Forester, 421 Morningside Dr. N.E., Albuquerque, New Mexico.
Territory: Arizona, New Mexico.
Specialization: 4, 15, 16, 17. Also land classification.

East Texas Wood Treating Co., Nacogdoches, Texas.
Consultant: W. W. Talbert.
Territory: Texas and surrounding states.
Specialization: 4, 6, 16, 17, 18.

William A. Eastman, Jr., Consulting Forester, William A. Eastman & Co., Inc., 410 Green Building, Seattle 1, Washington.
Territory: Pacific Northwest.
Specialization: 10, 15, 16, 17, 18. Also preparation and administration of timber sales, land appraisal, timberland brokerage, and timberland management.

Nils B. Eckbo, Industrial Forestry Consultant, 26 Rhodes Avenue, Parktown, Johannesburg, South Africa.
Territory: Southern Africa.
Specialization: Industrial forestry.

W. G. Edwards, 503 West Fairmount Ave., State College, Pennsylvania.
Specialization: 3, 10, 13, 15, 16, 18. Also small sawmill problems, both logging and milling phases.

Carl F. Ehelebe, 5921 S. E. Monroe St., Milwaukie 22, Oregon.
Territory: Mexico pine regions.
Specialization: Cost and economic studies of forest operations, forest and wood utilization, market studies and trade promotion (forest products), timber valuation and appraisal.

Inman F. Eldredge, Sr., 1354 Moss Street, New Orleans 19, Louisiana.
Territory: Lower South.
Specialization: Resource surveys for large operations; advice and counsel in large-scale land purchase programs; consultation with forestry staffs on management policy and practice in larger operations.

L. J. Enright, Consulting Forester, P.O. Box 238, College Park, Maryland.
Territory: Maryland; not limited.
Specialization: 1, 6, 15, 18. Also park management and policy; landscape planting and design.

Charles F. Evans, Consulting Forester, 2867 Piedmont Road, Atlanta, Georgia.
Territory: Southeastern U. S.
Specialization: 4, 6, 16, 17, 18. (Registered Forester under Georgia state law.)

Farmcraft Associates, Inc., Forest Managers, 5008 Kelvin, Houston, Texas. and Box 4344, Alexandria, Louisiana.
Consultants: Stuart F. Clark, Leo McDonald, Bob Isom.
Territory: Southern U. S.
Specialization: Forest investments and technical forest management for private and industrial holdings.

Fenner & Day, Company, Free Space Combustion Engineering, 4355 Bermar Avenue, El Sobrante, California.
Consultant: Ralph L. Fenner.
Territory: California.
Specialization: 2, 4, 6, 14. Wildland fire control and use.

David S. Findlay, Consulting Forester, 20 East 5th Street, Jamestown, New York.
Territory: Western New York and Pennsylvania.
Specialization: 4, 15, 16, 17.

Joseph E. Finnegan, Consulting Forester, Cante 11, Desp. 203, Mexico, D. F.
Territory: Mexico, Guatemala, and Honduras.
Specialization: 3, 5, 6, 7, 10, 11, 13, 15, 16, 17, 18, 19, 20.

George M. Fisher, Consultant Landscape Forester, P. O. Box 300, Tyler, Texas.
Territory: Northeastern Texas.
Specialization: 1, 5, 7, 9, 18. Also city forestry and shade tree problems; landscape design, construction, and maintenance; forest parks and recreational planning.

C. V. Fisk, Consulting Forester, P. O. Box 524, Chariton, Iowa.
Territory: Iowa, Missouri, Nebraska, Kansas, Illinois.
Specialization: 4, 9, 16, 17. Also farm forestry.

Reginald D. Forbes, Consulting Forester, R.F.D. 1, Ambler, Pennsylvania.
Territory: Eastern U. S.
Specialization: 4, 6, 17, 18. Also forest resource surveys of timber available to manufacturing plants in specified territories.

Forestry Aids, Manning, South Carolina.
Consultants: Seymour I. Somberg, Richard E. Haas.
Territory: Southeastern U. S.
Specialization: 2, 3, 4, 8, 10, 11, 13, 15, 16, 17, 20. Acquisition and management for investors; forest resource surveys for industry.

Forest Land Management Co., P. O. Box 1046, Morgantown, West Virginia.
Consultant: Thomas G. Clark.
Territory: Northern West Virginia, Southwestern Pennsylvania, Western Maryland.
Specialization: Forest land appraisal, forest real estate, timber sales, and markets.

Forestry Associates, Inc., Box 122, Gray, Maine.
Consultants: Stephen C. Jacobs, R.F.D. #2, Gorham, Maine; Fred J. McLeary, Gray, Maine.
Territory: Maine and adjacent areas.
Specialization: 2, 3, 4, 6, 8, 13, 15, 16, 17, 18, 20. Also sustained yield plans, contract logging supervision, stumpage sales, and scaling. Small woodlot management a specialty. Tree marking.

Forestry Associates, Inc., P. O. Box 72, Hart, Michigan.
Territory: Michigan.
Specialization: 3, 4, 5, 6, 7, 9, 11, 13, 15, 16, 17, and 18.

Forestry Consulting Services, 720 South Durand, Jackson, Michigan.
Consultant: George D. Blair.
Territory: Midwest.
Specialization: 1, 2, 4, 11, 16, 19. Also various forest growth and vegetative control planning services to public utility industries.

Forestry Suppliers, Inc., Consulting Foresters and Suppliers, Battlefield Station, Jackson 4, Mississippi.
Consultants: Ben C. Meadows, Purvis R. Huff.
Territory: Gulf States.
Specialization: 3, 4, 6, 13, 15, 16, 17, 18. Also forest land analysis and management, growth studies, timber and land sales, and a complete line of supplies and equipment for foresters and timber owners.

R. C. Fraunberger, Forest Products Business Consultant, P.O. Box 49, Escanaba, Michigan.
Specialization: 2, 3, 4, 10, 11, 16, 17, especially in hardwoods, domestic and foreign.

E. A. Friend, Jr., 211 Causey Ave., Suffolk, Virginia.
Territory: Tidewater and Eastern Shore of Virginia, Northeast North Carolina.
Specialization: 4, 15, 16, 17. Absentee landowners' agent, damage and condemnation claims.

Emanuel Fritz, Consulting Forester, 102 The Uplands, Berkeley 5, California.
Territory: West; pine, redwood, and fir.
Specialization: 2, 3, 4, 6, 10, 11, 16, 17, 18, 19, 20, 21. Also consultant on state forest and park management and policy.

LeRoy Frontz, Consulting Forester, Allenwood, Pennsylvania.
Territory: Eastern U. S.
Specialization: 3, 4, 5, 6, 7, 9, 16, 17, 18. Also landscaping, forest and ornamental nurseries, farm forestry, forest parks and recreation, landuse planning, soil conservation, farm evaluation and appraisal.

William E. Garvey, Jr., La Plata, Maryland.
Territory: Southern Maryland.
Specialization: Timber cruising, appraisal and marking.

Charles M. Genaux, 5236 Fillmore Ave., Alexandria, Virginia.
Specialization: 2, 3, 4, 5, 6, 8, 11, 13, 16, 17, 18, 19. Also analysis and development of public and private forestry programs, and Washington representation.

John D. Gilmour, Consulting Forester, 5823 McLynn Avenue, Montreal, Quebec, Canada.
Territory: Not limited.
Specialization: 2, 4, 8, 10, 16, 17. Also tropical logging.

Nathan B. Golub, Consulting Forester, Buckstone Farm, Washington Crossing, Pennsylvania.
Territory: Pennsylvania and New Jersey.
Specialization: 4, 15, 16, 17, 18. Also water management plans. Registered engineer and surveyor in Pennsylvania.

Vernon A. Good, Consulting Forester, American Bank Building, Portland, Oregon.
Territory: Oregon, Washington, Idaho, Northern California.
Specialization: 2, 4, 8, 13, 14, 16, 17, 18. Timber marking, sales contracts and supervision, acquisition, aerial photo inventory, fire damage appraisals. Also watershed and land use management.

R. W. Graeber, Consulting Forester, 303 Hillcrest Road, Raleigh, North Carolina.
Territory: North Carolina.
Specialization: 4, 6, 13, 16, 17, 18. Also buying and selling timber and timberlands as service to either buyer or seller; adjusting problems arising from over-cutting or trespass.

T. F. Grayson & Company, Consulting Foresters, P. O. Box 110, Prescott, Arkansas.
Territory: Southern United States.
Specialization: 2, 3, 4, 8, 10, 11, 13, 15, 16, 17, 18. Also timber marking, purchase, sale, management, millsite locations. Appraisals: right-of-way, flowage easement, fee and partial taking, fire and salt water damage.

Green's Timber Service, Johnson City, Tennessee.
Consultant: L. Stanley Green.
Territory: Southeastern U. S.
Specialization: 2, 3, 4, 6, 10, 13, 16, 17, 18. Also custom sawmilling.

Clarence W. Griffith, 1001 Ouachita Bank Building, Monroe, Louisiana.
Territory: United States.
Specialization: Purchase and sale of timbered properties.

Kenneth Wayne Guenther, Forest Products Industrial Engineer, Coos Bay, Oregon.
Territory: Oregon, Washington, and California.

Specialization: Those fields relative to the industrial engineering applications to the forest products industries.

Alvin B. Hafer, Consulting Forester, Laurinburg, North Carolina.
Territory: North Carolina, South Carolina, and Southeast.
Specialization: 4, 15, 16, 17. Also purchase and sale of timbered properties.

Albert G. Hall and Associates, 1740 K Street, NW, Washington 6, D. C.
Specialization: 2, 3, 4, 5, 6, 7, 8, 11, 13, 16, 17, 18. Also Washington representation.

Giles G. Hall, Professional Forester, 402 Cumberland Avenue, North Augusta, South Carolina.
Territory: South Carolina, Georgia.
Specialization: 2, 3, 4, 5, 6, 7, 10, 11, 13, 16, 17, 18. Also tree pruning in planted stands.

Francis G. Hambrook, Consulting Forester, East Sandwich, New Hampshire (mailing address, R.F.D., Center Harbor, N. H.).
Territory: New Hampshire.
Specialization: 2, 4, 15, 17. Also management of timber properties and agent for absentee landowners, selective logging, timber marking and marketing assistance, timber stand improvement work, including improvement cuttings in immature stands.

Hammon, Jensen, and Wallen, Mapping and Forestry Services, 1209 8th Avenue, Oakland 6, California.
Consultants: Herbert A. Jensen, Arnold F. Wallen.
Territory: United States and foreign.
Specialization: 2, 3, 4, 6, 8, 10, 11, 13, 15, 16, 17, 18. Also planimetric and topographic mapping, land net delineation, general land classification for appraisal purposes and ranchland management, and aerial photogrammetric consulting service. Emphasis on aerial photo techniques in all activities.

David H. Hanaburgh, Consulting Forester, Buchanan, New York.
Territory: Northeast.
Specialization: 2, 3, 4, 9, 10, 11, 13, 16, 17. Also negotiation of rights for hunting, fishing, trapping, and water storage.

T. A. Hardes Lumber Company, P. O. Box 239, Bradford, Pennsylvania.
Consultant: Svend B. Rondum, William C. Knecktel.
Territory: N. W. Pennsylvania and S. W. New York.
Specialization: 2, 4, 6, 10, 11, 13, 16, 17, 18.

Rex S. Harper, Professional Forester, 918 Hawthorne St., Tallahassee, Florida.
Territory: Florida, Georgia.
Specialization: 4, 5, 6, 7, 13, 16, 17, 18.

Gene M. Harris, Registered Consulting Forester, 779 Arkansas Street, Tallahassee, Florida.
Territory: Florida, Georgia, and Alabama.
Specialization: 3, 4, 5, 6, 7, 8, 9, 12, 13, 15, 16, 17, 18.

Ralph W. Hayes, Consulting Forester, 2241 Myrtle Avenue, Baton Rouge, Louisiana.
Territory: Gulf States.
Specialization: 2, 3, 13, 15, 16, 17. Also investigation and settlement of claims regarding timber in use in the South.

George S. Haynes, Consulting Forester, S. 321 Bowdish Road, Opportunity, Washington.
Territory: Western Montana, northern Idaho, eastern Washington.
Specialization: 4, 6, 10, 15, 16, 17, 18.

Hiram L. Henderson, Manufacturer of Dry Kilns, 119 Stone Ridge Drive, Syracuse, New York.
Territory: Principally eastern states.
Specialization: 20. Also construction of lumber dry kilns.

V. W. Herlevich, Consulting Forester, 35 Ivey Circle, Wilmington, North Carolina.
Territory: North Carolina, South Carolina.
Specialization: 4, 6, 15, 16, 17, also forest fire damage appraisals.

Halsey M. Hicks, Consulting Forester, Box 575, Brattleboro, Vermont.
Territory: Not limited.
Specialization: 2, 3, 4, 8, 15, 16, 17.

Hamilton D. Hill, Consulting Forester, Glacier Creek Ranch, Seeley Lake, Montana.
Territory: Northern Rocky Mountain region.
Specialization: 4, 15, 16, 17, 18. Also highway location and construction surveys; detailed topographic surveying and mapping preliminary to irrigation.

Monterey L. Holst, Consulting Forester, P. O. Box 125, East Greenwich, Rhode Island.
Territory: New England.
Specialization: 3, 4, 6, 9, 10, 13, 15, 16, 17, 18, 21.

Douglas F. Horan, Consulting Forester, 321 South Iowa Avenue, Lakeland, Florida.
Territory: Florida.
Specialization: 4, 11, 15, 16, 17.

William P. House, Consulting Forester, Chesham, New Hampshire.
Territory: New Hampshire and adjacent areas.
Specialization: 2, 3, 4, 16, 17. Marking and stumpage sales.

Richard F. Howard, Forestwald, Box 14, Franklinville, New York.
Territory: Pennsylvania, New York, New England.
Specialization: 3, 4, 6, 15, 16, 17, 18.

T. M. Howerton, Jr., Forestry Consultant, Madison, Florida.
Territory: Southeastern states.
Specialization: Marketing, Management.

G. W. Hult, Consulting Forester, 3029 Johnson Street, Corvallis, Oregon.
Territory: Oregon, California, and southwestern U. S.
Specialization: 4, 16, 17. Also estate woodlands management; negotiation of cooperative sustained yield units; timber sales, acquisition, and exchanges.

LeRoy W. Huntington, Consulting Tropical Forester, 52 Wesley Street, Baldwin, New York.
Territory: Latin America, Orient, Africa.
Specialization: 2, 3, 4, 10, 11, 15, 16, 17, 18; and tropical hardwoods.

R. Wilson Hutchison, Consulting Forester and Logging Engineer, 167 Walnut Lane, Eugene, Oregon.
Territory: Washington, Oregon, California.
Specialization: 2, 3, 4, 6, 10, 15, 16, 17. Registered professional engineer of the State of Oregon.

Gorham E. Jackson, Consulting Forester, 604 West Main Street, Washington, North Carolina.
Territory: Eastern North Carolina, southeastern Virginia. All forest types.
Specialization: 2, 4, 6, 9, 10, 13, 15, 16, 17, 18. Also investigations of forest resources for pulp and paper companies, and land agent for absentee timberland owners.

M. E. Jelley, Consulting Forester, 122 Haywood Avenue, Chattanooga 5, Tennessee.
Territory: Southeastern and eastern states.
Specialization: 2, 3, 4, 10, 11.

David G. Jennings, Consulting Forester, 110 Spring Street, Port Jefferson, New York.
Territory: New York.
Specialization: 1, 3, 4, 6, 15, 18.

Robert A. (Bob) Jiles, Jr., Route 3, Ruston, Louisiana, and Box 142, York, Alabama.
Territory: Gulf States.
Specialization: Timber cruising and forest management.

F. J. G. Johnson, 709 Metropolitan Bldg., Vancouver, B. C., Canada.
Territory: British Columbia (no regional limitation).
Specialization: 2, 3, 4, 6, 11, 15, 16, 17. Also park and municipal forest development.

Ralph S. Johnson, Laurinburg, North Carolina.
Territory: Eastern Carolinas.
Specialization: 3, 4, 6, 13, 15, 16, 17.

Robert W. Jones, Rt. 2, Box 2187, Bellevue, Washington.
Territory: Washington.
Specialization: 10, 11, 15, 16, 17, 18. Also photogrammetry and court cases concerning boundary disputes.

E. V. Jotter, Consulting Forester, 30 Cedarlawn Drive, Dayton 5, Ohio.
Territory: Ohio, Kentucky.
Specialization: 3, 4, 6, 9, 11, 16, 17, 18. Also development and management of community forests,

conservation education, cooperation with soil conservation districts.

Frank E. Karpick, 134 Kay St., Buffalo 15, New York.
Territory: Northeastern United States.
Specialization: 1, 5, 7. Landscaping, and planting and maintenance programs for city shade trees.

Keedwell & Elliott, Consulting Foresters, Emporia, Virginia.
Consultants: Stuart G. Keedwell and Frank A. Elliott.
Territory: Eastern and southern U. S.
Specialization: 3, 4, 10, 11, 13, 15, 16, 17. Also forest litigation and purchase and sale of land and timber.

John F. Kellogg, Forester, Urania, Louisiana.
Territory: Louisiana; pine and hardwood.
Specialization: 4, 5, 11, 16, 17.

Kiefer and Quaile, Consulting Foresters, Lakeville, Connecticut.
Consultant: George C. Kiefer, Jr.
Territory: Eastern U. S.
Specialization: 4, 6, 15, 16, 17, 18. Also management of timber properties and plantations, timber marking and marketing and agent for woodland owners.

H. Thorn King, Consulting Forester and Land Surveyor, Hancock, New Hampshire. (S.A.F. Affiliate Member.)
Territory: Southwestern New Hampshire.
Specialization: 2, 3, 4, 15, 16, 17, 18. Also farm forestry and private forestry; marking; registered land surveyor.

Joseph C. Kircher, Consulting Forester, Mount Dora, Florida.
Territory: Southern U. S.
Specialization: 2, 4, 6.

G. E. Knapp, Consulting Forester, 661 Forest Hill Road, Macon, Georgia.
Territory: Southen states.
Specialization: 2, 4, 10, 11, 13, 16, 17, 18.

Robert F. Knoth & Company, Foresters, Appraisers, Surveyors, 39 Broad Street, Charleston 3, South Carolina.
Consultants: Robert F. Knoth, Russell Wells.
Territory: Domestic and foreign.
Specialization: 4, 6, 10, 11, 13, 15, 16, 17, 18. Land agent for absentee timberland owners; foreign timberland investigations; veneer log inspection and procurement; timber investments.

Arthur Koehler, Wood Technologist, 1959 Thayer Ave., Los Angeles, 25, California.
Specialization: Wood utilization.

The Langdale Company, P. O. Box 980, Valdosta, Georgia.
Consultants: Harley Langdale, Jr., T. E. Connell.
Territory: Georgia, northern Florida; slash pine belt.
Specialization: 2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19. Also custom sawing.

Frank M. Langford, Waverly, Tennessee.
Territory: Middle Tennessee, South Kentucky, and North Alabama.
Specialization: Timber management—evaluation.

Lauderburn-White, 1204 Adeline Street, Hattiesburg, Mississippi.
Consultants: D. E. Lauderburn, John B. White.
Territory: South Mississippi and adjacent territory.
Specialization: 4, 11, 16, 17. Complete timber sales service, marking, finding buyers of stumpage, timber sale contracts, supervision and inspection of cutting operations, technical marketing assistance to small sawmills.

Frank J. Lemieux, Consulting Forester, 833 Whitney Building, New Orleans, Louisiana.
Territory: Southern states, Mexico, Central and South America.
Specialization: 2, 4, 6, 13, 15, 16, 17.

Paul C. Lemon, Consulting Forester, State College, Albany 3, New York.
Territory: New York.
Specialization: 1, 6, 9, 14. Also commercial pilot, applications of aviation to forestry.

T. A. Liefeld, Consulting Forester, Thomasville, Georgia.
Territory: Florida, Georgia.
Specialization: 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18.

L. D. Lloyd, Consulting Forester, Flying L Ranch, Glenwood, Washington.
Territory: Worldwide.
Specialization: 2, 3, 4, 6, 8, 10, 13, 15, 16, 17. Also purchase and transportation of logs and pulpwood.

Harvey J. Loughead, Consulting Forester, 399 Vanderbilt Road, Biltmore Station, Asheville, North Carolina.
Territory: Eastern U. S.
Specialization: 3, 4, 12, 13, 16, 17. Also watershed management.

Curtis R. Lytle, Consulting Forester, 11 Bacon Street, Wellsboro, Pennsylvania.
Territory: Pennsylvania and adjoining states.
Specialization: 1, 4, 11, 13, 15, 16, 17, 18. Also farm forestry, timber sale contracts, damage appraisals, sugar-bush management, watershed management, estate woodland management, and agent for absentee timberland owners.

Robert T. MacDougall, Jr., 124 Cresta Drive, Ukiah, California.
Territory: Coast pine and southern redwood regions of California.
Specialization: Timber cruising, forest management, mapping.

Donald K. Maissurow, Consulting Forester, New Haven Avenue, Derby, Connecticut.
Territory: New England.
Specialization: 1, 4, 5, 7, 15, 16, 17, 18. Also landscape forestry.

Carol W. Marlow, 1020 Valley St., Dayton 4, Ohio.
Territory: Ohio.
Specialization: 1, 5, 7. Landscaping, planting, and city shade tree maintenance programs.

E. D. Marshall, Consultant in Forest Products, 541 Humason Ave., Lufkin, Texas.
Territory: Texas and surrounding states; Mexico, Central and South America.
Specialization: 3, 11, 13, 19, 20, 21.

Mort May, Timber Cruiser, 6 Cedar St., Eureka, California.
Territory: Northern California.
Specialization: 10, 15, 16, 17.

Edward A. McAllister, 311 Lynchburg Avenue, Colonial Heights, Virginia.
Territory: Virginia and Southeast.
Specialization: 3, 4, 9, 10, 11, 13, 16, 17.

Earl M. McChesney, Consulting Forester, 57 New York Street, Bangor, Maine.
Territory: Maine, New York.
Specialization: 1, 4, 15, 17, 18. Also personnel work.

Thomas A. McFarland, Consulting and Contracting Forester, 60 Holman Avenue, Athens, Georgia.
Territory: Georgia.
Specialization: 2, 4, 10, 15, 16, 17. Also timber, timberland, and farmland broker.

James T. McMahon, P. O. Box 88, Kountze, Texas.
Territory: Texas and Louisiana.
Specialization: 4, 13, 16, 17, 18. All phases of forest land management.

Philip C. Meinzer, Consulting Forester, Route 3, Kokomo, Indiana.
Territory: Indiana.
Specialization: 1, 4, 16, 17, 18.

Fred B. Merrill, Consulting Forester, Box 66, Zachary, Louisiana.
Territory: Mississippi and Louisiana, within 100 miles of Baton Rouge.
Specialization: 4, 5, 6, 7, 11, 13, 16, 17. Also buying and selling timberlands; training estate and company personnel; and Gaylord pulpwood dealer in East and West Feliciana Parishes.

William H. Meyer, Consulting Forester, West Rupert, Vermont.
Territory: Primarily Southwestern Vermont.
Specialization: 2, 3, 4, 11, 16, 17, 18. Also farm management and conservation education.

Raymond M. Miller, Consulting Forester, 322½ E. Fifth Ave., Warren, Pennsylvania.
Territory: Pennsylvania, New York, Ohio.
Specialization: 4, 16, 17. Also timber and lumber marketing service.

Milliken Forestry Co., 31 Heathwood Circle, Columbia, South Carolina.
Consultant: William F. Milliken.
Territory: Southeast, principally South Carolina.

Specialization: 3, 4, 6, 11, 13, 15, 16, 17, 18. Also sustained yield plans and contract tree planting; timberland agent for absentee timberland owners.

William J. Mills, Forest Engineer, 201 Volunteer Building, Chattanooga 2, Tennessee.
Territory: Southeastern states, Mexico.
Specialization: 3, 4, 11, 13, 15, 16, 17.

Malcolm A. Milne, Consulting Forester and Landscape Engineer, 433 Clay Avenue, Rochester, New York.
Territory: Central and western New York.
Specialization: 1, 5, 7, 18. Also landscaping, estate development and management, and forest recreation.

R. B. Milne, Consulting Forester, Box 371, Petersburg, Virginia.
Territory: Eastern states; all forest types.
Specialization: 3, 4, 10, 16, 17.

Stuart Moir, Forest Counsel, Western Forestry and Conservation Association, 712 U. S. National Bank Building, Portland 4, Oregon.
Territory: Western states.

Wm. Mollenhauer, Jr., Landuse Consultant, 186 West Avenue, Pitman, New Jersey.
Territory: New Jersey.
Specialization: 4. Also flood and erosion control; ecological surveys of plant and animal relations in forest and rural areas; economic and social surveys of forest and rural areas, including labor relations.

Robert Moore, Consulting Forester, Danville, Pennsylvania.
Territory: Not restricted.
Specialization: 2, 3, 4, 6, 8, 10, 11, 13, 15, 16, 17, 18, 19. Also bankruptcy cases, trade association work, coal lands, trusteeship cases, litigation and damage claims, estate problems.

R. A. Morin, Consulting Forester, 2532 Sunset Ave., Greenville, North Carolina.
Territory: Northeast North Carolina.
Specialization: 4, 13, 16, 17, 18. Also growth studies, timber marking and marketing, and agent for absentee timberland owners.

George W. Morrill, Jr., Consulting Forester, 13½ South Spring Street, Concord, New Hampshire.
Territory: New Hampshire, Maine, Vermont.
Specialization: 4, 13, 15, 16, 18. Also landscaping, forest recreation, and beautification.

Charles H. Moyer, Consulting Forester, R.F.D. #2, Newfield, New York.
Territory: Northeast.
Specialization: 4, 10, 15, 16, 17.

National Timber Consultants, Box 497, Salem, Missouri.
Consultants: Ed Woods, Charles Kirk.
Territory: Central and southern states.
Specialization: Management information. land appraisal, and valuation, mapping and estimating.

New England Forest Industries, Inc., 3 North State Street, Concord, New Hampshire.
Consultants: Walter L. Koenig, Concord, N. H.; Dr. Gordon M. Day, Contoocook, N. H.; Richard L. Johnston, Center Harbor, N. H.; Arthur Peabody, Center Sandwich, N. H.; Hans Meissner, Concord, N. H.; Parker Whipple, Tamworth, N. H.; Bradford Monk, Penacook, N. H.
Territory: New England.
Specialization: Planting, selective logging, appraisals, forest land brokerage, intermediate cuttings, marking, surveys-cruises.

New England Forestry Foundation, 3 Joy Street, Boston 8, Massachusetts.
Consultants: J. Milton Attridge, Acting Chief Forester; Robert T. Bolton, Albert J. Boris, Allison G. Catheron, II, Stanley B. Coville, Herbert L. Crafts, Frederic P. Elwert, Richard H. Illinik, Kenneth E. Jones, Gerald C. Knickerbocker, William N. Lane, Frederick J. McLeary, Allan W. Plumb, Donald R. Poppema, Harrison S. Ripley.
Territory: New England.
Specialization: 2, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, 18.

New England Silvicultural Service, Athol Road, Petersham, Massachusetts.
Consultant: Fred M. Hunt.
Territory: Central New England.
Specialization: 4, 10, 15, 16, 17, 18. Also management of pine plantations.

Samuel A. Newman, P. O. Box 156, Everett, Washington.
Territory: Washington.
Specialization: 8, 10, 15, 16, 17. Also aerial surveys and forest litigation.

Nittany Timberlands, Inc., P.O. Box 191, State College, Pennsylvania.
Consultants: Richard C. Bedger, Donald L. Dick, P. F. English, H. Arthur Meyer, Orvel A. Schmidt, Frank J. Wawrynovic.
Territory: Pennsylvania.
Specialization: 4, 9, 13, 16, 17, 18.

Leon A. Nix, Consulting Forester and Logging Expert, Box 82, Port Credit, Ontario, Canada.
Territory: Not limited.
Specialization: 2, 3, 4, 6, 10, 13, 15, 16, 17. Also farm woodlot management.

Northeast Forestry Service, 262 Blauvelt Road, Pearl River, New York.
Consultant: Stanley Mesavage.
Territory: Northeast.
Specialization: 3, 4, 10, 11, 15, 16, 17.

Northern Tree Co., Inc. Petoskey, Michigan.
Consultants: Thomas F. Schweigert, George E. Young.
Territory: Michigan.
Specialization: 1, 4, 5, 6, 7, 15, 16, 17, 18. Also contract tree planting; registered land surveyor.

Ernest Nutting & Co., Consulting Forester, Box 51, Camden, South Carolina.
Associate: Royal E. Cummings.
Territory: The Carolinas and Georgia.
Specialization: 4, 13, 15, 16, 17, 18. Serving timberland owners.

H. R. Oliver, Consulting Forester and Surveyor, 1504 Broad Street, Camden, South Carolina.
Territory: Carolinas.
Specialization: 4, 13, 15, 16, 17. Also forest land appraisals, timber and land sales, and dogwood and hickory industry consultant.

Wm. B. Osborne, Consulting Forester, 2167 N. W. Marshall Street, Portland, Oregon.
Territory: Western states, British Columbia.
Specialization: 6, 16.

Charles R. Page, Jr., Forest Land Manager and Consultant, 415 Friar Road, Chattanooga 11, Tennessee.
Associates: W. C. McMaster, James D. Brown.
Territory: Southeastern states.
Specialization: 4, 7, 11, 15, 16, 17, 18.

Penta Post and Treating Co., Box 5, Tuttle, Idaho, and 610 Bacon Drive, Boise, Idaho.
Consultants: Vernon Ravenscroft, Steele Barnett.
Territory: Idaho.
Specialization: 1, 2, 3, 4, 6, 14, 15, 16, 17, 18, 19.

Pomeroy & McGowin, Forest Managers, Monticello, Arkansas and Chapman, Alabama.
Consultants: L. K. Pomeroy, Julian F. McGowin (S.A.F. Associate Member), Z. W. White, T. R. Scott, Jr., W. V. Gandy, D. W. Samson.
Territory: Southern states, South America.
Specialization: 4, 8, 11, 13, 16, 17, 18. Also aerial forest surveys.

Pond & Moyer, Inc., Co., Consulting Foresters, 107 Homestead Road, Ithaca, New York.
Consultant: James D. Pond.
Territory: New York and Northeast, Latin America; northern hardwoods, spruce-fir, central hardwoods, tropical woods.
Specialization: 1, 2, 3, 4, 8, 10, 11, 13, 15, 16, 17, 18, 21.

Prentiss & Carlisle Company, Inc., Timberland Service—Engineers, 107 Court Street, Bangor, Maine.
Consultants: George T. Carlisle, Philip P. Clement, Robert W. Averill, George D. Carlisle, Edward K. Brann, Forest B. Nelson, Samuel L. Fuller.
Territory: United States, Canada.
Specialization: 2, 3, 4, 8, 10, 11, 13, 15, 16, 17, 18.

John G. Rawls Co., Consulting Foresters, 402 Rogers Avenue, Macon Georgia.
Consultant: John G. Rawls (S.A.F. Affiliate Member).
Territory: Southeast.
Specialization: 10, 12, 13, 15, 16, 17.

Arthur D. Read, Consulting Forester, 309 Riggs Street, West Monroe, Louisiana.
Territory: Southern pine and hardwood region.
Specialization: 4, 15, 16, 17, 18.

A. B. Recknagel, P. O. Box 15, Ithaca, New York.
Territory: Anywhere in continental United States.
Specialization: Forest management, forest utilization (particularly pulp and paper).

Reed Forestry & Equipment Co., Consulting Foresters, Box 102, Smithfield, North Carolina.
Consultant: R. E. Reed.
Territory: Southeastern states; all forest types.
Specialization: 2, 3, 4, 11, 13, 17, 16, 17, 18. Also custom sawing and sale of forestry equipment.

Tom Reimer, Consulting Forester, 1811 Whitney Ave., Albany, Georgia.
Territory: No restrictions.
Specialization: 2, 3, 4, 6, 10, 12, 13, 15, 16, 17, 18.

Charles E. Reynolds, 7733 S. E. 82nd Avenue, Portland 6, Oregon.
Territory: Washington, Oregon, and Northern California.
Specialization: 4, 10, 15, 16, 17, 18.

Robinson Improvement Company, St. Augustine National Bank, St. Augustine, Florida.
Consultant: Allen D. Nease.
Territory: Florida and South Georgia.
Specialization: 2, 3, 4, 5, 6, 7, 9, 10, 13, 15, 16, 17, 18.

Donald C. Rock, Consulting Forester and Engineer, Box 508, New Castle, Delaware.
Territory: Delaware.
Specialization: 2, 3, 4, 5, 10, 13, 15, 16, 17, 18. Registered land surveyor. Timber cruising is a specialty.

Frank J. Rockwell, Consulting Forester and Landscape Architect, 5436 West 36th Ave. So., Minneapolis 26, Minnesota.
Territory: Northern and western states, especially Great Lakes and Great Plains regions of U. S.
Specialization: 2, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, 18. Also land appraising, engineering, farm and city forestry, park and park management, recreation planning.

A. F. Roesel, Forest Engineer, 31 Mechanic Street, South Norwalk, Connecticut.
Territory: New England and northeastern states.
Specialization: 2, 3, 4, 10, 11, 12, 13, 15, 16, 17, 18. Also forest engineering for industries, timberland acquisition and sales, contract logging supervising, log scaling and grading.

Sable Mountain Corporation, 68 Phillips Street, Rutland, Vermont.
Consultant: Richard C. Rose.
Territory: Central Vermont.
Specialization: Woodland management, including marking and marketing of standing timber and trained work crew for planting, pruning, and timber stand improvement. Also operate own forest.

Leslie A. Sample, Consulting Forester, Route 2, Box 826, Shreveport, Louisiana.
Territory: Arkansas, Louisiana, Texas.
Specialization: 3, 4, 5, 6, 7, 13, 14, 15, 16, 17.

Roy Dale Sanders, Visual Education Technician, Rural Route 6, Eyrodale, Brainerd, Minnesota.
Territory: Unlimited.
Specialization: Forester, wildlife technician, photographer. The entire production supervision of 16 millimeter color educational motion pictures, including script writing, direction, photography, editing, and sound supervision. Also production of color and black and white still picture visual education material.

Sandhill Forestry Company, Route 2, Rockingham, North Carolina.
Consultant: Walter J. Marshburn, Jr.
Territory: Southeastern United States.
Specialization: 2, 4, 5, 13, 16, 17, 18. Also woodland property sales.

Joseph A. Schmidt, Consulting Forester, Box 476, Charleston, South Carolina.
Territory: Southeast.
Specialization: 4, 15, 15, 16, 17. Also growth studies, timber marking.

C. D. Schultz & Co., Inc., Foresters and Engineers, Forest Consultants, 547 White Henry Stuart Building, Seattle, Washington.
Consultants: C. D. Schultz, E. T. Schultz, W. E. Dyke.
Territory: Oregon, Washington, California; outside but no regional limitations.
Specialization: 2, 3, 4, 5, 6, 8, 10, 11, 13, 14, 15, 16, 17, 18, 20.

C. D. Schultz & Co. Ltd., Foresters and Engineers, Forest Consultants, 207 Hope Street, Vancouver, British Columbia.
Consultants: C. D. Schultz, E. T. Schultz and 5 members of the Canadian Institute of Forestry. Office staff, 30 members.
Territory: No regional limitations.
Specialization: 2, 3, 4, 5, 6, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20.

Lloyd N. A. Samuel, P. O. Box 1012, El Dorado, Arkansas.
Territory: Southern Arkansas and northern Louisiana.
Specialization: 2, 4, 15, 16, 17, 18. Also will accept jobs in small tracts.

James W. Sewall Company, Consulting Foresters, Old Town, Maine, and Fredericton, New Brunswick, Canada.
Consultants: Frank M. Call, Charles G. Reed, Carleton C. Young, Jr., Theodore C. Tryon (S.A.F. Affiliate Member), John E. O'Donnell, Edwin Forsythe.
Territory: Northeast.
Specialization: 3, 4, 5, 8, 13, 15, 16, 17, 18. Also aerial photography.

Arthur E. Sherman, Jr., 140 H. Street, Crescent City, California.
Territory: Washington, Oregon, California.
Specialization: 10, 15, 16, 17.

James R. Simmons, Consulting Forester, 30 Gordon Street, Bel Air, Maryland.
Territory: Eastern states.
Specialization: 2, 3, 4, 10, 15, 16, 17, 18.

William R. Sizemore & Co., Foresters and Surveyors, Tallassee, Alabama.
Consultants: William R. Sizemore, William T. Ogletree.
Territory: Alabama.
Specialization: 2, 3, 4, 8, 12, 13, 15, 16, 17, 18.

Samuel S. Snook, P. O. Box 521, Walterboro, South Carolina.
Territory: South Carolina.
Specialization: 4, 15, 16, 17.

Dean Solinsky, Hobart Bldg., San Francisco 4, California, and Mokelumne Hill, California.
Territory: California.
Specialization: Timberland appraisals and management.

Southeastern Foresters, Forest Consultants, 234 6th Avenue, North, Jacksonville Beach, Florida.
Consultants: Nelson B. Bowler, T. Von Bradshaw.
Territory: Southeastern U. S.
Specialization: 2, 4, 5, 8, 12, 15, 15, 16, 17, 18. Also timber resource investigations, timberland management, timber and land sales, insurance company representation for loans on forest properties.

Southern Timber Management Service, Home Office, 200 S. 22nd St., Birmingham, Alabama. Branch Offices, 404 Montgomery Ave., Sheffield, Alabama. P. O. Box 762, Auburn, Alabama. P. O. Box 582, Leesburg, Georgia.
Consultants: J. M. Bradley, Charles N. Dale, Jr., E. E. Murphy, V. Vickery, J. D. Seaman, J. T. Nisbet, Harry S. Larsen.
Territory: South.
Specialization: 1, 2, 3, 4, 10, 11, 12, 13, 16, 17, 18. Also acting as management foresters in charge for private, commercial, and industrial ownerships; timberland appraisals of all kinds with attention to current timber sales, improvement cutting, planting, and T.S.I. operations as a service under contract. Contracts or agreements under long term management contracts offered.

Frank Spearey, Consulting Forester, Landman, State Land Surveyor, P. O. Box 547, Nacogdoches, Texas. Branch office, Rusk, Texas. George D. Goodsell, Jr. (ranch).
Territory: Gulf States.

Specialization: 4, 15, 16, 17. All phases of land management.

Everett R. Stanford, Consulting Forester, 409 North Atlantic Boulevard, Alhambra, California.
Territory: Southern California; mountain watersheds, recreational areas.
Specialization: 1, 5, 6, 7, 18. Also forest watershed management, erosion control, mountain forest home sites, forest park planning and management, structural pest control.

T. J. Starker and Son, 3755 Van Buren Street, Corvallis, Oregon.
Operating consultants: T. J. Starker, Bruce Starker.
Territory: Oregon.
Specialization: 1, 3, 4, 10, 16, 19, 21.

J. F. Stauss, Consulting Forester, 9 Nowlan Road, Hillcrest, Binghamton, New York.
Territory: Northeast and Canada.
Specialization: 2, 3, 4, 8, 10, 11, 13, 15, 16, 17, 18. Also marketing and other forest products; litigation and damage claims.

Fred Stell, Consulting Forester, P.O. Box 42, Glenwood Springs, Colorado.
Territory: Colorado, Wyoming, New Mexico.
Specialization: 4, 6, 9, 14, 15, 16, 17, 18.

E. A. Sterling, 39 Lake Avenue, Montrose, Pennsylvania.
Territory: General.
Specialization: 4, 6, 13, 16, 18.

Raymond E. Stevens, Consulting Forester, 4416 McCulloch Street, Duluth 4, Minnesota.
Territory: Northern parts of Minnesota, Wisconsin.
Specialization: 4, 15, 16, 17, 18. Also field investigation and forest litigation.

Edward Stuart, Jr., Operating and Consulting Forester, Avalon, Virginia and Hertford, North Carolina.
Territory: Eastern U. S.
Specialization: 2, 3, 4, 10, 11, 13, 14, 15, 16, 17, 18. Also investigations and arbitration of claims; operational management in manufacturing and marketing of forest products.

Richard L. Templin, Jr., Registered Logging Engineer, 1004 N. W. Hawthorne, Grants Pass, Oregon.
Territory: Oregon, and California.
Specialization: Cruising, management, surveying, logging engineering.

Tillinghast & Reed, Consulting Foresters, Ellis Building, Madison, West Virginia.
Consultants: John Tillinghast, Marvin Reed, Robert Keiling.
Territory: West Virginia, eastern Kentucky, western Virginia.
Specialization: 3, 4, 6, 15, 16, 17, 18, 19, 20. Timberlands in coal producing areas a specialty; services available on job basis or on annual retainer fee basis.

J. M. Tinker, Registered Forester, P. O. Box 298, Statesboro, Georgia.
Territory: Southeastern Georgia.
Specialization: Timber cruising for small owners.

Donnie P. Todd, Jr., Consulting Forester, Box 168-B, Johns Island, South Carolina.
Territory: Southeast.
Specialization: 2, 3, 4, 5, 6, 7, 10, 12, 13, 16, 17, 18. Emphasis on aerial photo techniques. Also agent for absentee timberland owners.

Tree Farm Management Service, 364 East Broadway, Eugene, Oregon.
Consultants: Verne D. Bronson, Chief Forester, Roger W. Burwell, Lyle H. Seymour, Thomas D. Vandershule, Keith Petrie.
Territory: Oregon and Washington.
Specialization: 3, 4, 5, 6, 7, 8, 15, 16, 17, 18. Complete tree farm management, inventory and special studies of forest lands, salvage harvest supervision, forestry research, aerial photo procurement and interpretation.

Henry H. Tryon, Consulting Forester, 258 Mountain Road, Cornwall-on-Hudson, New York.
Territory: New York and New England.
Specialization: 3, 4, 10, 15, 17, 18. Also specializing in sprout hardwood region.

Turner and Shannon, Registered Surveying—Consulting Forestry, Colwell-Arnold Building, Kittanning, Pennsylvania.
Consultant: Robert B. Shannon, Joseph F. Gray.
Territory: Pennsylvania, New York, Ohio, West Virginia.
Specialization: 2, 4, 15, 16, 17, 18. Also timber damage appraisals; farm appraisals; construction layout.

William H. Utley, P. O. Box 645, New Bern, North Carolina.
Territory: North Carolina.
Specialization: 4, 15, 16. Also industrial investigations, tax evaluations—public and private.

Eugene P. Van Arsdel, Forester and Forest Pathologist, 943 E. Lakeside Street, Madison 5, Wisconsin.
Territory: Illinois, Indiana, and Wisconsin.
Specialization: 1, 4, 5, 15, 17, 18.

John C. Van Camp, Jr., Consulting Forester, 2028 Hawthorne Drive, Rockford 115, Illinois.
Territory: Northern Illinois, southern Wisconsin.
Specialization: 4, 5, 6, 7, 15, 16, 17, 18. Also farm and estate forestry, litigation and damage claims, landscaping.

James M. Vardaman & Company, Morris Building, Laurel, Mississippi.
Consultant: James M. Vardaman.
Territory: Mississippi, southern Alabama, eastern Louisiana.
Specialization: 16, 17. Also own and operate medium-sized tree farm.

Wall and Larson, Foresters, 4612 Fegan Way, Sacramento, California.
Territory: Western states.
Specialization: 2, 3, 4, 6, 7, 10, 11, 15, 16, 17, 18. Also, licensed surveying. Photo interpretation as applied to logging engineering, cruising, and mapping; timber sale supervision; scaling; and timber dispute arbitration.

Wallace Bros. Timber Service, 5875 Dunwoody Road, Chamblee, Georgia.
Consultant: W. Gordon Wallace.
Territory: Georgia.
Specialization: Custom or contract logging and sawmilling, thinnings, planting, cruising, marking, etc.

Robert D. Washburn, Forestry Consultant, Route 1, Box 461, Marquette, Michigan.
Territory: Upper Michigan and the Lake states.
Specialization: 2, 4, 10, 15, 16, 17. Also land-appraisal. Registered surveyor, State of Michigan.

Arthur J. Weinheimer, Consulting Forester, R.F.D. #1, Old Chatham, New York.
Territory: Eastern New York.
Specialization: 4, 18.

Edward H. Werner, Consulting Forest Engineer, 3122 H Street, Sacramento, California.
Territory: California, southern Oregon.
Specialization: 3, 4, 10, 16. Also timber and log procurement, timber sale and logging contract specifications, state forest practice act regulations, timber trespass, claims, and acquisition of timber and range lands.

Western Timber Services, 340 E. 2nd Avenue, N., Roseburg, Oregon, and 2520 I Street, Arcata, California.
Consultants: Robert E. Kleiner, Everett E. Givens.
Territory: Not restricted.
Specialization: 2, 4, 8, 10, 15, 16, 17, 18.

J. Atwood Whitman, Consulting Forester, Glendon, North Carolina. Branch office at Warsaw, North Carolina.
Territory: Eastern and southern United States.
Specialization: 2, 3, 4, 8, 15, 16, 17, 18. Also forest damage appraisal, forest litigation, growth analysis, timber type maps, and municipal forestry.

S. A. Wilde, Soils Department, University of Wisconsin, Madison 6, Wisconsin.
Territory: Wisconsin, Minnesota, Michigan, Missouri, Illinois, Indiana, Ohio.
Specialization: 18. Including survey of forest tracts, selection of planting sites, management of forest nursery soils.

Richard E. Wilson, 126 Kelvin Place, Ithaca, New York.
Territory: Not restricted.
Specialization: 18. Establishment and care of plantations.

S. Leigh Wilson, Consulting Forester, 857 Congaree Drive, Florence, South Carolina.
Specialization: 3, 4, 16, 17, 18.

Paul T. Winslow, Consulting Forester, Staatsburg, Dutchess County, New York.
Territory: Northeast.
Specialization: 1, 3, 4, 11, 15, 16, 17, 18.

K. B. Wood & Associates, Inc., 436 Terminal Sales Bldg., Portland 5, Oregon.
Territory: National.
Specialization: 2, 10, 15, 16, and 17.

Woodland Managers, P. O. Box 542, Lake City, Florida.
Consultants: Philip J. Moses, General Manager, L. A. Hetrick, K. R. Swinford, E. W. Gemmer.
Territory: Southeastern United States.
Specialization: Aerial photo interpretation, cruising, damage appraisal, forest management planning, forest maps, growth and yield computations, land surveying, land valuation, tree marking, timber marketing, tree planting, insect problems.

J. E. Woodman, Barnett Bank Building, Jacksonville 2, Florida.
Territory: Eastern United States and Canada.
Specialization: 3, 4, 8, 12, 13, 16, 18.

Herman Work, 1005 Selma Blvd., Staunton, Virginia.
Territory: General.
Specialization: 2, 3, 4, 6, 11, 13, 16. Especially qualified in economics of pulpwood and use of leftovers for pulping.

Robert E. Worthington, Consulting Forester, Quilcene, Washington.
Territory: Olympic Peninsula.
Specialization: 2, 10, 15, 16, 17.

James G. Yoho, Consulting Forester, 613 High Street, Brownsville, Pennsylvania.
Territory: Eastern United States.
Specialization: 2, 8, 11, 16, 17. Appointments by mail preferred.

Lawrence W. Zach, Consulting Forester, Route 2, Box 281, Woodburn, Oregon.
Territory. Western Oregon.
Specialization: 4, 15, 16, 17.

E. A. Ziegler, Consulting Forester, College Park, Lewisburg, Pennsylvania.
Territory: Middle Atlantic States and Southeastern States to and including Florida.
Specialization: 2, 3, 4, 6, 8, 12, 13, 15, 16, 17, 18.

The Society of American Foresters

The Society of American Foresters is a professional organization of technically trained foresters. It is a democratic, nonpolitical, nonprofit association of over 9,000 members.

As stated in its Constitution, the objects of the Society are to represent, advance, and protect the interests and standards of the profession of forestry, to provide a medium for exchange of professional thought, and to promote the science, practice, and standards of forestry in America.

Membership in the Society of American Foresters is recognition of a man's professional abilities and attainments. No person can acquire such recognition if it is not deserved.

The Society is governed by a president, vice president, and nine other Council members. Policies established by the Council are translated into action programs which are administered by the executive secretary whose office is in the Mills Building, Washington, D. C.

An annual meeting of the Society includes technical sessions arranged by the eleven Divisions which specialize in forest management, silviculture, private forestry, forest economics, forest products, forest recreation, forest wildlife management, range management, watershed management, public relations, and education. Other features of the meeting include sessions on general topics and a joint conference of the Council and Section delegates.

Sections are regional units of the Society. The United States, its territories, and Canada are divided into 21 Sections which elect their own officers, hold meetings, and conduct appropriate projects and activities. Many Sections have subsidiary units called Chapters which hold informal meetings and field trips to acquaint foresters with each other and with local forestry matters.

The JOURNAL OF FORESTRY is a monthly publication of the Society. Other publications include *Forest Terminology*, *Fifty Years of Forestry*, *Foresters' Manual* (now in preparation), and others.

Through its publications and meetings the Society provides a medium for the exchange of professional information and promotes cooperation among foresters and with those in allied fields.

By encouraging its members to promote the adoption, use, and improvement of forestry practices, the Society endeavors to extend the benefits of good forestry practices to all timberland owners and users of forest products.

Through the operation of committees, by the functioning of Chapters, Sections, Divisions, and the Council, and by expressions of the membership through referendums, the Society helps establish the policies and standards to be observed by professional foresters.

CONSULTING FORESTERS, CLASSIFIED BY STATES

Consulting foresters are listed below according to the state in which each has headquarters.

Alabama
- Glenn O. Antonie
- Deep South Consulting Foresters
- Robert A. (Bob) Jiles, Jr.
- Pomeroy & McGowin
- William R. Sizemore & Co.
- Southern Timber Management Service

Arkansas
- T. F. Grayson and Co.
- Pomeroy & McGowin
- Louis N. A. Seeman

California
- Charles H. Bunting
- California Foresteering
- John D. Coffman
- Fenner & Day Co.
- Emanuel Fritz
- Hammen, Jensen, and Wallen
- Arthur Koehler
- Robert T. MacDougall, Jr.
- Mort May
- Arthur E. Sherman, Jr.
- Dean Solinsky
- Everett R. Stanford
- Wall and Larson
- Edward H. Werner
- Western Timber Services

Colorado
- Fred Stell

Connecticut
- Connwood, Inc.
- Kiefer and Quaile
- Donald K. Maissurow

District of Columbia
- Albert G. Hall & Associates

Florida
- Floyd F. Clark
- Rex S. Harper
- Gene M. Harris
- Douglas F. Horan
- T. M. Howerton, Jr.
- Joseph C. Kircher
- Robinson Improvement Co.
- Southeastern Foresters
- Woodland Managers
- J. E. Woodman

Georgia
- W. R. Barnhill
- Edward J. Claney
- Charles F. Evans
- G. E. Knapp
- The Langdale Company
- T. A. Liefeld
- Thomas A. McFarland
- John G. Rawls
- Tom Reimer
- Southern Timber Management Service
- J. M. Tinker
- Wallace Bros. Timber Service

Idaho
- Penta Post and Treating Co.

Illinois
- John C. Van Camp, Jr.

Indiana
- Carl M. Carpenter
- Consulting Foresters
- Philip C. Meinzer
- Donald C. Rock

Iowa
- C. V. Fisk

Kentucky
- Dudley C. Carey

Louisiana
- Henry L. Bango
- Frank W. Bennett & Associates
- Inman F. Eldredge, Sr.
- Farmcraft Associates, Inc.
- Clarence W. Griffith
- Ralph W. Hayes
- Robert A. (Bob) Jiles, Jr.
- John F. Kellogg
- Frank J. Lemieux
- Fred B. Merrill
- Arthur D. Read
- Leslie A. Sample

Maine
- Philip T. Coolidge
- Forestry Associates, Inc.
- Earl M. McChesney
- Prentiss & Carlisle Company, Inc.
- James W. Sewall Company

Maryland
- L. J. Enright
- William E. Garvey, Jr.
- James R. Simmons

Massachusetts
- C. P. Cronk
- New England Forestry Foundation
- New England Silvicultural Service

Michigan
- Forestry Associates, Inc.
- Forestry Consulting Services
- R. C. Fraunberger
- Northern Tree Co., Inc.
- Robert D. Washburn

Minnesota
- William T. Cox
- Frank I. Rockwell
- Roy Dale Sanders
- Raymond E. Stevens

Mississippi
- Robert K. Boydell
- Keith Cranston & Associates
- Randle J. Dedeaux
- Forestry Suppliers, Inc.
- Lauderburn-White
- James M. Vardaman & Co.

Missouri
- National Timber Consultants

Montana
- Paul E. Bruns
- Hamilton D. Hill

New Hampshire
- Francis G. Hambrook
- William P. House
- H. Thorn King
- George W. Morrill, Jr.
- New England Forest Industries, Inc.

New Jersey
- Wm. Mollenhauer, Jr.

New Mexico
- W. T. Doherty

New York
- Raymond D. Adolph
- Allen W. Bratton
- Nelson C. Brown
- David B. Cook
- David S. Findlay
- David H. Hanaburgh
- Hiram L. Henderson
- Richard F. Howard
- LeRoy W. Huntington
- David G. Jennings
- Frank E. Karpick
- Paul C. Lemon
- Malcolm A. Milne
- Charles H. Moyer
- Northeast Forestry Service
- Pond & Moyer, Inc., Co.
- A. B. Recknagel
- J. F. Stauss
- Henry H. Tryon
- Arthur J. Weinheimer
- Richard E. Wilson
- Paul T. Winslow

North Carolina
- Thos. W. Alexander
- J. Wayne (Pete) Chalfant
- T. S. Coile
- R. W. Graeber
- Alvin B. Hafer
- V. W. Herlevich
- Gorham E. Jackson
- Ralph S. Johnson
- Harvey J. Longhead
- R. A. Morin
- Reed Forestry & Equipment Co.
- Sandhill Forestry Co.
- Edward Stuart, Jr.
- William H. Utley
- J. Atwood Whitman

Ohio
- William J. Bozett
- E. V. Jotter
- Carol W. Marlow

Oregon
- Bigley and Feiss
- Brown and Brown
- Carl F. Ehelebe
- Vernon A. Good
- Kenneth Wayne Guenther
- G. W. Hult
- R. Wilson Hutchinson
- Stuart Moir
- Wm. B. Osborne
- Charles E. Reynolds
- T. J. Starker and Son
- Richard L. Templin, Jr.
- Tree Farm Management Service
- Western Timber Service
- K. B. Wood & Associates, Inc.
- Lawrence W. Zach

Pennsylvania
- S. Gayley Atkinson
- Nelson C. Brown
- C. Dana Chalfant
- W. G. Edwards
- Reginald D. Forbes
- LeRoy Frontz
- Nathan B. Golub
- T. A. Hardes Lumber Co.
- Curtis R. Lytle
- Raymond M. Miller
- Robert Moore
- Nittany Timberlands, Inc.
- E. A. Sterling
- Turner and Shannon
- James G. Yoho
- E. A. Ziegler

Rhode Island
- Monterey L. Holst

South Carolina
- John R. Allison
- Milton Applefield
- John C. Billingsley
- Bishop Brothers
- Lewis M. Boice
- Gordon Bowker
- Lucas M. Dargan
- Forestry Aids
- Giles G. Hall
- Robert F. Knoth & Co.
- Milliken Forestry Co.
- Ernest Nutting & Co.
- H. R. Oliver
- A. P. Russell
- Joseph A. Schmidt
- Samuel S. Snook
- Donnie P. Todd, Jr.
- S. Leigh Wilson

Tennessee
- Ernest E. Ahler
- Green's Timber Service
- M. E. Jelley
- Frank M. Langford
- William J. Mills
- Charles R. Page, Jr.

Texas
- L. L. Bishop
- N. D. Canterbury
- East Texas Wood Treating Co.
- Farmcraft Associates, Inc.
- George M. Fisher
- E. D. Marshall
- James T. McMahon
- Frank Spearey

Vermont
- Halsey M. Hicks
- William H. Meyer
- Sable Mountain Corporation

Virginia
- E. A. Friend, Jr.
- Charles M. Genaux
- Keedwell & Elliott
- Edward A. McAllister
- R. B. Milne
- Edward Stuart, Jr.
- Herman Work

Washington
- William A. Eastman, Jr.
- George S. Haynes
- Robert W. Jones
- L. D. Lloyd
- Samuel A. Newman
- C. D. Schultz & Co., Inc.
- Robert E. Worthington

West Virginia
- Forest Land Management
- Tillinghast & Reed

Wisconsin
- George Banzhaf & Co.
- Eugene P. Van Arsdel
- S. A. Wilde

Canada
- Belanger and Bourget
- John D. Gilmour
- F. J. G. Johnson
- Leon A. Nix
- C. D. Schultz & Co., Ltd.
- James W. Sewall Co.

Africa
- Nils B. Eckbo

Mexico
- Joseph E. Finnegan

Foresters' Code of Ethics

Adopted November 12, 1948

The purpose of these canons is to formulate guiding principles of professional conduct for a forester in his relations with other foresters, with his employers, and with the public. The observance of these canons secures decent and honorable professional and human relationships, establishes enduring mutual confidence and respect, and enables the profession to give it maximum service.

Professional Life

1. The professional forester will utilize his knowledge and skill for the benefit of society. He will cooperate in extending the effectiveness of the forestry profession by interchanging information and experience with other foresters, and by contributing to the work of forestry societies, associations, schools, and publications.

2. He will advertise only in a dignified manner, setting forth in truthful and factual statements the services he is prepared to render for his prospective clients and for the public.

Relations with the Public

3. He will strive for correct and increasing knowledge of forestry and the dissemination of this knowledge, and will discourage and condemn the spreading of untrue, unfair, and exaggerated statements concerning forestry.

4. He will not issue statements, criticism, or arguments on matters connected with public forestry policies, without indicating, at the same time, on whose behalf he is acting.

5. When serving as an expert witness on forestry matters, in a public or private fact finding proceeding, he will base his testimony on adequate knowledge of the subject matter, and render his opinion on his own honest convictions.

6. He will refrain from expressing publicly an opinion on a technical subject unless he is informed as to the facts relating thereto, and will not distort or withhold data of a substantial or other nature for the purpose of substantiating a point of view.

Relations with Clients, Principals, and Employers

7. He will be loyal to his client or to the organization in which he is employed and will faithfully perform his work and assignments.

8. He will present clearly the consequences to be expected from deviations proposed if his professional forestry judgment is overruled by nontechnical authority in cases where he is responsible for the technical adequacy of forestry or related work.

9. He will not voluntarily disclose information concerning the business affairs of his employers, principals, or clients, which they desire to keep confidential, unless express permission is first obtained.

10. He will not, without the full knowledge and consent of his client or employer, have an interest in any business which may influence his judgment in regard to the work for which he is engaged.

11. He will not, for the same service, accept compensation of any kind, other than from his client, principal, or employer, without full disclosure, knowledge, and consent of all parties concerned.

12. He will engage, or advise his client or employer to engage, other experts and specialists in forestry and related fields whenever the client's or employer's interests would be best served by such actions, and will cooperate freely with them in their work.

Relations with Professional Foresters

13. He will at all times strive to protect the forestry profession collectively and individually from misrepresentation and misunderstanding.

14. He will aid in safeguarding the profession against the admission to its ranks, of persons unqualified because of lack of good moral character or of adequate training.

15. In writing or in speech he will be scrupulous to give full credit to others, in so far as his knowledge goes, for procedures and methods devised or discovered and ideas advanced or aid given.

16. He will not intentionally and without just cause, directly or indirectly, injure the reputation or business of another forester.

17. If he has substantial and convincing evidence of unprofessional conduct of a forester, he will present the information to the proper authority for action.

18. He will not compete with another forester on the basis of charges for work by underbidding through reduction of his quoted fee after being informed of the fee quoted by a competitor.

19. He will not use the advantages of a salaried position to compete unfairly with another forester.

20. He will not attempt to supplant another forester in a particular employment, after becoming aware that the latter has been definitely engaged.

21. He will not review the work of another forester, for the latter's employer, without the other's knowledge, unless the latter's connection with the work has been terminated.

22. He will base all letters of reference or oral recommendation on a fair and unbiased evaluation of the party concerned.

23. To the best of his ability he will support, work for, and adhere to the principles of the merit system of employment.

24. He will not participate in soliciting or collecting financial contributions from subordinates or employees for political purposes.

25. He will uphold the principle of appropriate and adequate compensation for those engaged in forestry work, including those in subordinate positions, as being in the public interest and maintaining the standards of the profession.

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Forestry News

PRESENTATION OF AWARDS to School of Forestry graduates by University of Minnesota President Morrill at the banquet celebrating the 50th anniversary of the school on October 23. From left to right those pictured are: Charles L. Lewis, Jr., William T. Cox, A. Dale Chapman, President Morrill, Dr. Henry Schmitz, Dr Samuel A. Graham, and Samuel B. Detwiler.

Minnesota Honors Forestry Alumni at 50th Anniversary

Henry Schmitz, president of the University of Washington, Seattle, and former chief of the University of Minnesota School of Forestry, has received the "Builder of the Name Award," highest honor that the University of Minnesota can bestow. Schmitz is the fourth person to be so honored in the University's history. President James Lewis Morrill presented the award at a banquet celebrating the 50th Anniversary of Minnesota's School of Forestry in Minneapolis. Over 500 forestry alumni, their families, and guests attended the banquet, part of the Oct. 23-24 celebration.

Dr. Schmitz became president of the University of Washington in 1952. He was director of forestry work at Minnesota from 1925 to 1947 and dean of Minnesota's College of Agriculture, Forestry, and Home Economics from 1944 to 1952. He received his bachelor's degree in forestry at the University of Washington and his doctor's degree from Washington University, St. Louis.

Dr. Schmitz was president of the Society of American Foresters from 1942 to 1945 and served as editor of the JOURNAL OF FORESTRY from 1937 to 1942. He is a Fellow of the Society.

Dr. Schmitz's speech at the banquet was entitled "The Golden Age Lies Ahead." He spoke of the success of land grant colleges in stimulating publicly supported higher education. This success will continue, he said, but it will be accomplished with increasing difficulty from criticisms that such edu-

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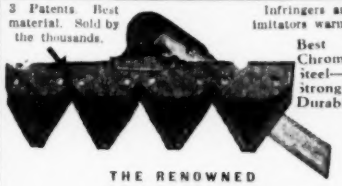
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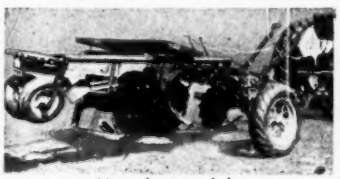
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cation costs too much, that it trains too many people, and that the institutions carry on too many activities. However, he concluded, the institutions will continue to broaden their work, as the University of Minnesota and its School of Forestry have done, in training undergraduates and professional people in research and in public service.

At the banquet President Morrill presented "Outstanding Achievement Awards" to five alumni of the School of Forestry:

A. Dale Chapman, president of the Chapman Chemical Company, an important producer of wood preservatives and agricultural chemicals. Through his research he has made numerous contributions to knowledge about wood-destroying fungi and wood preservation.

William T. Cox, first state forester of Minnesota and organizer of the state's Division of Forestry. Later he was director of Minnesota's Department of Conservation. More recently he has been a consulting forester, specializing in South American forestry problems.

Samuel B. Detwiler, a leading forest pathologist, who for years led the fight against white-pine blister rust in this country. More recently he has led research on erosion control problems for the Soil Conservation Service.

Samuel A. Graham, professor of forest entomology at the University of Michigan. He is author of one of the leading textbooks in forest entomology, and has long been an advocate of control of forest insects by silvicultural methods.

Charles L. Lewis, Jr., general manager of the Midwest Cranberry Company, who has played a major part in developing the cranberry industry in Wisconsin. His continuing interest in forestry has been shown by his maintenance of a forestry scholarship.

George L. Drake, President of the S.A.F., was present at the celebration, and at the banquet extended greetings and congratulations from the Society to the School of Forestry.

Trees in One Year

Dr. Katsusaburo Miyamoto, a Japanese botanist, announced at Buenos Aires recently that he has discovered a way to make trees grow in a year to a maturity that usually takes eight to ten years. Dr. Miyamoto, who has lived in Argentina since 1919, is reported to have said he has found a method of obtaining plant hormones in rock form. Such hormone rocks, buried in the ground, dissolve within a week or two when adequately irrigated and induce rapid plant growth.

Kentucky Forest Resources Report Issued

If well managed and protected, the sawtimber volume of Kentucky's forests could be doubled or tripled, according to a report released by the Department of Agriculture.

The publications, Forest Resource Report No. 7, entitled "Kentucky's Forest Resources and Industries," culminates three years of forest survey work carried on in Kentucky by the Central States Forest Experiment Station of the Forest Service located in Columbus, Ohio. Cooperating in the study were the Tennessee Valley Authority Division of Forestry Relations, the Kentucky Department of Conservation, and the University of Kentucky.

To increase sawtimber volume five steps are recommended. (1) Adopt cutting practices that will remove the low-quality and cull trees and allow the rapid-growing, potentially high-quality

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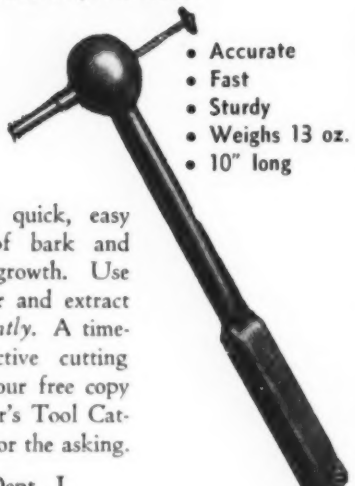

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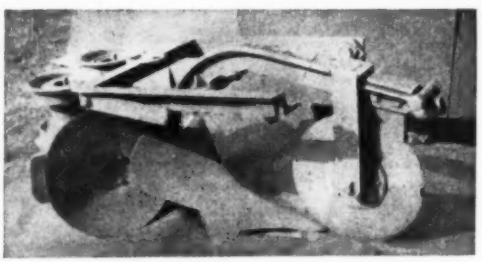

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trees to grow to a diameter of at least 16 inches and larger before harvesting. (2) Protect all forest land from fire, insects and disease. (3) Discourage livestock grazing on hardwood timberland. (4) Conduct research to determine the best management and utilization practices for the forests of Kentucky. (5) Encourage integrated harvesting, marketing, and utilization of forest products to help channel high quality timber to uses requiring high quality timber and to expand the use of low quality wood. Forests cover 45 percent of the land of Kentucky or a total of about $11\frac{1}{2}$ million acres. Ninety-four percent of the forest land is privately owned—about half by farmers. Less than 1 million acres are in public ownership.

According to the report, Kentucky has about 25 billion board feet of sawtimber and is growing more than 1 billion board feet each year. Though the amount being grown exceeds the amount being cut each year by about 60 percent, there is still room for much improvement in the condition of Kentucky's forests.

In general, the report states, the timber stands are understocked in volume and are poor in quality. Though individual stands may contain much more, the average volume of all stands is only slightly more than 2,000 board feet. Nearly 85 percent of the sawtimber volume is in grade 3 logs—those that on the average yield only about 20 percent of their volume in No. 1 common or better lumber. In addition, about every fifth sawtimber-size tree is a cull.

A copy of this report, written by O. Keith Hutchison and Robert K. Winters of the Central States Forest Experiment Station, may be obtained by writing to the Station at 111 Old Federal Building, Columbus 15, Ohio, or to the Kentucky Department of Conservation, Division of Forestry, Frankfort.

Education

Educational Broadcasts Planned in New York

Representatives of six state agencies have planned a series of broadcasts over Station WGY, Schenectady, N. Y., entitled "Plantations for Profit." Professor Floyd E. Carlson, radio and television specialist in the extension department of the State University of New York College of Forestry, has acted as chairman of the group including members of the Cornell University Extension Service, the New York State Conservation Department, the 4-H Club, the Soil Conservation Service, the Production Marketing Administration, and the College of Forestry.

The six-month series starting Jan. 4 will emphasize methods woodlot owners can use to make their plantations pay. The schedule of broadcasts includes such topics as federal cost-sharing of planting, tree procurement, flood control and reforestation, pole construction, fire protection, and explanations of agency services to forest managers.

Production and Industrial Rel. Conf. Held at State Univ. of New York

The State University of New York College of Forestry was the scene of the first annual Production and Industrial Relations Conference, sponsored by the National Association of Furniture Manufacturers, Nov. 10 and 11. The conference was conducted jointly by the N.A.F.M., the College of Forestry, the Manufacturers Assn. of Syracuse, and the Jamestown Area Furniture Assn.

Nationally-known industrial experts addressed the 40 furniture executives who attended.

Tree Improvement Facilities Dedicated at Texas A and M

Ceremonies opening the new forest tree improvement research facilities were held Nov. 17 at Texas A and M. Following the special ceremonies, an inspection tour was conducted by Dr. A. D. Folweiler, director of the Texas Forest Service, through the new facilities made available by the Texas A & M College System Board of Directors at a cost of more than $60,000. The new forest tree improvement facilities include a greenhouse, lath house, laboratories and offices.

Attendance at the ceremony was by invitation only, and included primarily the principals or representatives of

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companies financially supporting the forest tree improvement program. Much of the money for operating the plant facilities, designed especially for forest genetics research, was solicited through the efforts of Ernest L. Kurth of Keltys, Texas. The money is being used to provide fellowships for graduate students, purchase equipment and supplies and to employ laboratory technicians and other help. The tree improvement studies are under the direction of Dr. Bruce Zobel. The main test area and arboretum, known as Arthur Temple Research Area, is a 53-acre tract near Fastrill. An additional test area, known as the Ernest Kurth Research Area is located near Groveton. Other test areas are located in Navarro, Lavaca, Robertson and Caldwell counties and at Many, La.

Government

Central International Forest Insect and Disease Conference

The first regular fall meeting of the Central International Forest Insect and Disease Conference was held at the Forest Insect Laboratory in Sault Ste. Marie, Ont., Oct. 6-7, 1953. The program consisted of three discussion periods on problems of forest entomology and pathology pertinent to the central region of the United States and Canada.

Dr. C. G. Riley, Forest Biology Division, Saskatoon, Sask., acted as moderator and Dr. R. L. Anderson, U.S.D.A., St. Paul, Minn., as discussion leader of a consideration of poplar diseases emphasizing Hypoxylon canker.

The forest tent caterpillar was the subject of a discussion in which Dr. A. C. Hodson, University of Minnesota, acted as moderator and Mr. W. L. Sippell, Forest Biology Division, Sault Ste. Marie, was discussion leader.

The third session dealt with the principles and problems involved in forest insect and disease surveys. The session was moderated by Dr. M. L. Prebble, Forest Biology Division, Ottawa, and the discussion was initiated by Dr. R. D. Shenefelt, University of Wisconsin, and Dr. J. R. Hansbrough, U.S.D.A., New Haven, Conn.

Tours of the Forest Biology laboratories, a business meeting, and a social evening completed the program.

The 1954 conference will be held in Wisconsin under the chairmanship of Dr. J. E. Kuntz, Department of Plant Pathology, University of Wisconsin.

Jay H. Price Retires; Was Regional Forester, Reg. 9

Jay H. Price, regional forester for the Forest Service at Milwaukee retired December 31, 1953. He was succeeded by H. Dean Cochran, formerly head of personnel management for the U.S.F.S. in Washington.

Mr. Price's retirement terminates 33 years of service in forestry on the Pacific coast and in the midwest. He has directed activities in the northcentral region since 1939, coming to Milwaukee from San Francisco. Under his leadership a third of a million acres of forest lands have been planted in this region, timber production from the national forests has been increased eightfold, and the area of state and private forest land given fire protection has been increased by 20 percent.

In addition to administration of the national forests, Mr. Price has been responsible for cooperative forestry programs with the states of Michigan, Wisconsin, Minnesota, North Dakota, Iowa, Illinois, Indiana, Ohio, and Missouri.

A native of California and an engineering graduate of the University of California, Mr. Price worked as logging engineer for lumber companies in California and Panama before enlisting in the Army in 1917. He was later commissioned and served in France with the 20th Engineers, a forestry regiment. He entered the Forest Service in 1920 as logging engineer for the California Region, became regional fire chief in 1927, and was appointed associate regional forester at San Francisco in 1935.

Mr. Price was elected a Fellow of the S.A.F. in 1951, and in 1952, in recognition of distinguished service and leadership, he was given a superior service award by the Department of Agriculture.

H. Dean Cochran Becomes Region 9 Head

H. Dean Cochran, formerly chief, Division of Personnel Management, has been appointed regional forester, Region 9, to succeed Jay H. Price.

Mr. Cochran entered the Forest Service in 1920 as forest assistant on the Routt National Forest in Colorado, and since that time has worked in the Denver regional office in public relations; as associate director of the Prairie States Forestry Project in Lincoln, Neb. through which the shelterbelts were established; has been in charge of timber management on the

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national forests in the Rocky Mountain Region; and has been in charge of state and private forestry cooperation in Colorado, Wyoming, South Dakota, Kansas, and Nebraska. He served as personnel chief of the Rocky Mountain Region for one year before becoming personnel chief of the entire Forest Service in 1942.

He received his A.B. degree from Illinois College, Jacksonville, Ill., in 1918, and a B.S. degree in Forestry in 1920 from Colorado Agricultural College. In 1945 the Colorado Agricultural College awarded Mr. Cochran an honorary doctor of science degree.

E. W. Fobes Assigned to Liberia as Forestry Advisor

E. W. Fobes, forester at the U. S. Forest Products Laboratory, Madison, Wis., has been sent to Liberia, West Africa, as forestry advisor for the Foreign Agricultural Service of the U. S. Department of Agriculture. His job will be to train native foresters, help establish national forests and set up programs of conservation and management that will insure the full productiveness of those forests in the future. He will also work to establish export markets for Liberian forest products.

Mr. Fobes has been with the U. S. Forest Service for 21 years, seven of which have been at the Laboratory.

National Forest Burn Acreage at New Low

The 1953 forest fire season was the most successful in the history of organized fire protection on the national forests of the Pacific Northwest region, Kermit W. Linstedt, regional fire control chief, reported recently.

A new low of 1,542 acres was burned through Oct. 31 on Pacific Northwest lands protected by the Forest Service. Total area in the region protected by the Forest Service is 26,061,046 acres. The previous low was in 1948 when 3,031 acres burned.

Total number of fires during the season was 1,104, close to the annual average of the past five years. Of this number, 317 were man-caused, 130 occurring in October alone. Most of the October fires resulted from carelessness of hunters and were an increase of 26 percent over the number during the same month last year.

Moran Appointed Calif. Deputy State Forester

F. H. Raymond, acting state forester, has announced the appointment of Lewis Moran as deputy state forester in charge of the central coast district of the California Division of Forestry with headquarters at Monterey. Moran will fill the position vacated by C. G. Strickland, who retired earlier this year from state service. Carl G. Albertus, assistant deputy state forester, has been temporarily in charge of the district and will remain as assistant to Moran.

Moran, after graduation from the University of California, School of Forestry in 1938, entered the service of the California Division of Forestry

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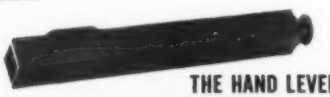

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and served as assistant state forest ranger. He entered the U. S. Naval Reserve in 1942 and served three years; 16 months of which were in the Pacific area.

In November, 1945, Moran returned to state service as a forest technician and was appointed a state forest ranger in 1948. In 1949 he was promoted to assistant deputy state forester in the northern district with headquarters in Redding where he has worked until the present time.

Set New Low in Oregon Forest Fire Losses

Fire losses during 1953 on the 13 million acres of forest land coming under the jurisdiction of the state's forestry department and its cooperating forest protection associations was the lowest in the Oregon state board of forestry's 42-year history, according to State Forester George Spaur.

He said that 787 fires burned only 1,503 acres of forest land. An unusual fact was the large proportion of lightning fires—422 or more than 53 percent. Normally the maximum number of lightning fires seldom reaches 30 percent.

Maxwell Appointed to Md. Forests and Parks Comm.

R. Brooke Maxwell of Baltimore, who studied forestry at Yale University, has been appointed to the Maryland Forests and Parks Commission; and, following the appointment, was elected chairman by the five-man body. The term of office is for five years.

This Commission is the policy making board for the Maryland Department of Forests and Parks, of which Joseph S. Kaylor, Annapolis, is director.

Federal Aid Funds for Wildlife, Fisheries Announced

Apportionment of 1954 federal aid funds to the states for wildlife and fisheries projects has been announced by Secretary of Interior Douglas McKay. Total allotted to the states for game work under the Pittman-Robertson Act is $11,784,600, an increase of $1,759,494 over last year; total allotted for federal-aid fisheries under the Dingell-Johnson Act is $4,299,916, as against $2,508,527 for last year. The states will match the funds, $1 for $3.

Forest Research Adv. Committee Recommends Bark Beetle Research

Research on bark beetles should be expanded, the Forest Research Advisory Committee recommended as it concluded a 3-day meeting in Washington Oct. 28. Established under authority of the Research and Marketing Act of 1946, the committee meets annually.

The committee said that bark beetles are perhaps the most serious enemies of U. S. Forests.

Among its other recommendations on production research, the committee placed particular emphasis on study of diseases attacking seedlings in forest nurseries, study on root diseases of conifers, tree improvement, and the work of range reseeding. The committee also strongly advocated acceleration of the Forest Survey. It urged continuing intensive research in fire prevention to develop better ways to forecast the danger and to prevent the occurrence of fires.

Stoddard Named to Minnesota Forestry Commission

The Interim Commission on Forestry recently formed by the Minnesota Legislature has appointed Charles H. Stoddard of Minong, Wis., as its executive secretary. Senator Herbert Rogers announced, in making the appointment, that Mr. Stoddard will serve on a consultant basis in order to continue his duties as executive director of The Independent Timber Farmers of America.

The purpose of the commission is to re-examine present forestry laws and problems with a view toward making such revisions as may be needed to fit current forest situation. Among the questions facing the ten-man legislative committee are consolidation of state, county, and national forests through land exchanges; forest taxation; state reforestation and nursery problems; recodification of state forestry laws; and improvement of timber sale arrangements for small timber farmers.

N.E. National Forest Receipts Pass Million-dollar Mark

Timber cut last fiscal year from the seven national forests in the northeast (Maine to Kentucky area) totaled 94,700,000 board feet, Regional Forester Charles L. Tebbe has announced. Income from stumpage payments amounted to $1,037,000.

This is the first time that income from timber cut on these northeastern forest lands has passed the million-dollar mark since they were purchased, mostly in depleted condition, and placed under federal protection and

management. The new high figure was credited to a combination of increasing volume of available timber in recent years, and the current high price of stumpage.

Total receipts from all uses on these areas were $1,109,887 including fees for grazing, rights of way, summer home sites and other uses.

Industrial and Private

Canada Tree Farm Committee Shows Six-Month Progress

The national Tree Farm committee of Canada has made its first report, covering the first six months of the Canadian Forestry Association-sponsored program, which shows that the movement is actively started in Quebec, Ontario, and New Brunswick.

The report, dated November 2, shows that Quebec, which had the first three tree farms dedicated, leads with 15 farms, and Ontario has two. New Brunswick expects to dedicate three in the near future. As of November 2, the total acreage under management was 75,325 acres.

N.L.M.A. Holds Annual Meeting

The National Lumber Manufacturer's Assoc. held its annual meeting Nov. 2-4 at the Shoreham Hotel, Washington, D. C. Activities included a panel discussion on the current lumber market; committee meetings; discussion of legislation affecting the lumber industry; the report of the executive vice president; a tour of the laboratory of the Timber Engineering Co., research affiliate of N.L.M.A.; and

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the election of new officers for 1954.

New president of N.L.M.A. is James R. Bemis, Prescott, Ark., president of the Ozan Lumber Co. Mr. Bemis served as first vice president during 1953 and is currently president of the Southern Pine Association. Ralph R. Macartney, Weyerhaeuser Timber Co., Klamath Falls, Ore., was elected chairman of the board of directors after having served as N.L.M.A. president during the past year.

Judd Greenman, general manager of the Vernonia Division of the Long-Bell Lumber Co., Vernonia, Ore., was elected first vice president, succeeding Mr. Bemis.

W. C. Hammerle Becomes "Forest Farmer" Managing Editor

W. C. Hammerle has accepted a position with the Forest Farmers Assn. of Atlanta, Ga. as assistant to the executive secretary and managing editor of *The Forest Farmer* magazine, effective last Dec. 1.

Hammerle comes to the F.F.A. from the Southern Pine Association, New Orleans, where he has been forester since 1944.

Prior to that time he was state forester of Georgia from Sept., 1939, to Jan., 1941, and later held the same position in South Carolina. He received his training at N. Y. State College of Forestry, graduating in 1925.

The F.F.A. is the largest timberland owners' association in America. Its 1,300 members own more than 20,000,000 acres of timberland in 15 southern states.

J. V. Whitfield, farmer and state senator of Burgaw, N. C., is the association's president; J. Walter Myers, Jr., of Atlanta, is executive secretary and editor of "The Forest Farmer."

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Micklewright Joins Research Staff of T.E.C.O.

James T. Micklewright, a graduate of Iowa State College and recipient of a scholarship awarded in 1952 by the National Lumber Manufacturers Assn., has joined the research laboratory of Timber Engineering Co.

Mr. Micklewright will work, as wood technologist, with fire resistance tests on wood products in T.E.C.O.'s recently completed fire chamber.

A. M. Williams Succeeds Harris Reynolds

Alfred M. Williams, Jr., has been named secretary of both the Massachusetts Forest and Park Assn. and the New England Forestry Foundation in Boston to replace Harris A. Reynolds who died October 16.

Williams has been with T.V.A., Division of Forestry Relations, for the past ten and a half years. Prior to that he was employed by the Connecticut State Board of Fisheries and Game. He received his B.S.F. degree from the University of Connecticut in 1937.

Minn. & Ont. Paper Co. Start Advisory Service

Small woodlot owners and contractors in the area from which the Minnesota and Ontario Paper Co. supplies its International Falls specialty paper mill may now secure timber management advice, according to George B. Amidon, the company's director of forest management. This newly instituted activity is called the Timber Management Advisory Service. It is aimed at helping the small landowner grow more and better wood on his land, thereby increasing his income and helping to insure a steadier supply of wood for the company's mill.

Twenty foresters in the company are assigned to the advisory service. This assistance is to be tailored to meet the individual need. It may consist of

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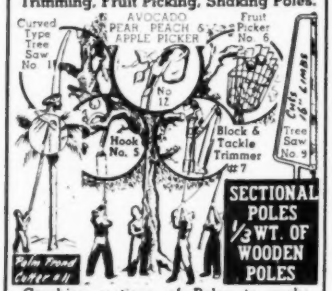
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offering advice of a general nature to an owner who calls at the pulpwood purchase department office, or go to the extent of the preparation of a timber type map, brief management plan, and suggested cutting practices. Foresters will aid owners in marking timber for cutting and by advice on thinnings or salvage operations. Mechanical tree planters are available for loan to farmers.

The Timber Management Advisory Service of the company includes, in addition to on-the-spot assistance to farmers of the area, an explanatory booklet, *Trees Are A Crop*, posters, and other informational material.

Weyerhaeuser Lumber Company Announces Promotions

Jon. R. Titcomb, manager of Weyerhaeuser Timber Company's Springfield, Ore., lumber division, has been named assistant to the firm's general manager.

Veteran of nearly 30 years' experience with the company, Titcomb will take over his new duties in Tacoma the first of the year.

Succeeding Titcomb will be George H. Weyerhaeuser, who has been his administrative assistant since April. Charles W. Preppernau, branch logging manager, will become assistant lumber division manager.

Titcomb is a graduate of Dartmouth College, and has worked for the Weyerhaeuser firm since 1924. Weyerhaeuser graduated from Yale University in 1949, with a degree in industrial administration, and has worked for the firm since that time. Preppernau received his forestry degree from the University of Washington in 1925, and joined Weyerhaeuser in 1934.

44th Pacific Logging Congress

Speaking on the need of an adequate access road system in the national forests, Edward P. Cliff, assistant chief, U. S. Forest Service, was one of the principal speakers at the 44th Pacific Logging Congress in Seattle, Nov. 4-6.

Mr. Cliff said that adequate access roads would allow bringing the rate of cut up to full allowable capacity; provide more effective forest pest control at less cost; cut the costs of fire

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control; and help beat the seasonal logging problem and widen the logging season.

In closing sessions, the congress passed several resolutions, among them ones calling for a halt to further federal acquisition of private and state lands; favoring continued federal aid in combatting insects; commending the Keep Green movement; and favoring state legislation to permit state banks to accept timber as collateral for credit.

Roy A. Gould, Diamond Lumber Co., Portland, Ore., was elected president of the congress for the coming year.

Other speakers were retiring congress president Clyde A. Corman, Weyerhaeuser Timber Co., and E. A. Swigert, The Hyster Co., Portland.

A.F.P.I. Elect Officers and Trustees

Leonard G. Carpenter of Minneapolis, has been elected president of American Forest Products Industries, Inc. Mr. Carpenter is president of McCloud Lumber Co., with lumber manufacturing operations in McCloud, Calif.

Three other presidents of wood-using companies were elected to the board of trustees of A.F.P.I. at its annual meeting Wednesday, Oct. 28, 1953, in Washington.

The new trustees are John H. Hinman, president of International Paper Co., New York City; Charles M. Hines, president, Edward Hines Lumber Co., Chicago; and Ernest L. Kurth, president, Angelina County Lumber Co., Keltys, Tex.

Officers reelected were William B. Greeley, Port Gamble, Wash., chairman; Walter J. Damtoft, Champion Paper and Fibre Co., Canton, N. C., and William Swindells, Willamette Valley Lumber Co., Portland, Ore., vice president; P. H. Glatfelter, P. H. Glatfelter Co., Spring Grove, Pa., treasurer; and Charles A. Gillett, Washington, D. C., secretary and managing director.

Trustees reelected to three-year terms included: W. J. Bailey, West Virginia Pulp and Paper Co., New York City; J. L. Camp, Jr., Camp Manufacturing Co., Franklin, Va.; E. W. Daniels, Harbor Plywood Corp., Hoquiam, Wash.; W. J. Dixon, St. Regis Paper Co., New York City; D. B. Frampton, D. B. Frampton & Co., Columbus, Ohio; and Messrs. Damtoft, Swindells, and Hines.

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A kit of materials for determining the amount of pentachlorophenol in an oil solution is available on request from Wood-Treating Chemicals Company, 1700 S. Second St., St. Louis 4, Mo.

The kit, which will be furnished without charge to treating plant operators, inspection agencies, and users of penta-treated wood, contains the test and indicator chemicals needed for the lime-ignition analysis method recently accepted as standard by the American Wood Preservers' Association. Penta, a wood preservative widely used by utilities, railroads, millwork manufacturers and home builders, is manufactured by Monsanto Chemical Company.

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FOREST PRODUCTS AND UTILIZATION ABSTRACTS

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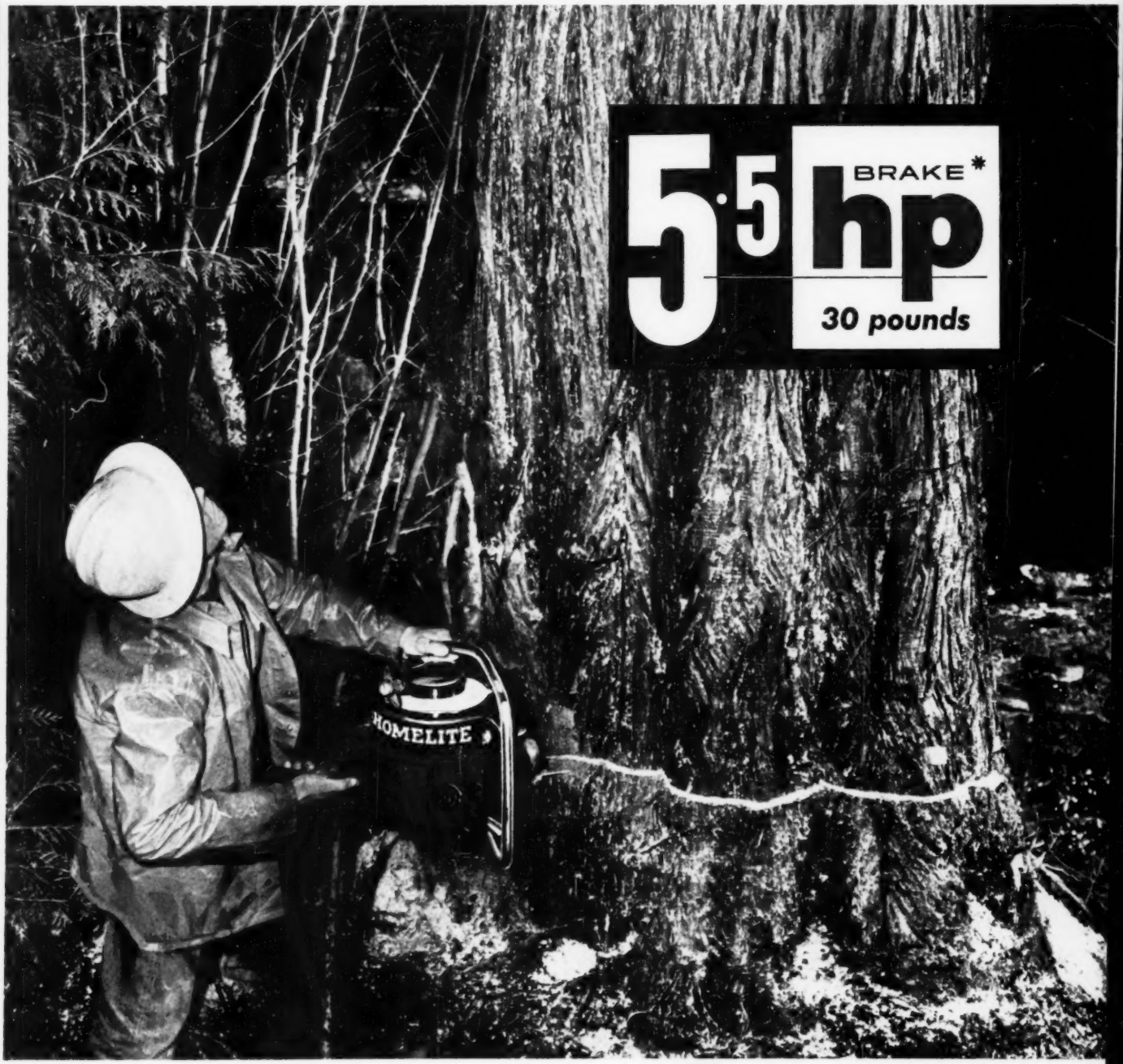

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